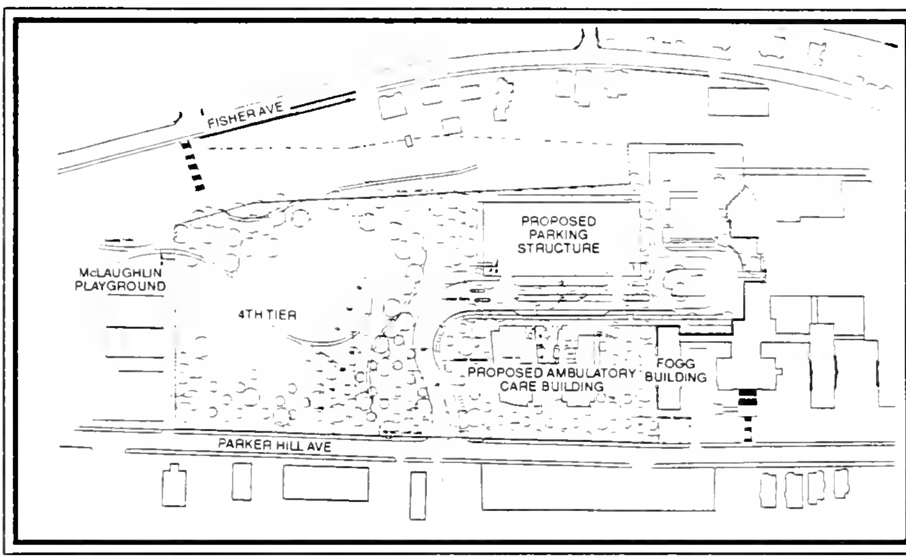
NEW ENGLAND BAPTIST HOSPITAL AMBULATORY CARE BUILDING/ PARKING STRUCTURE

DRAFT PROJECT IMPACT REPORT

145 Parker Hill Avenue
Boston, Massachusetts 02120

APRIL 1994



Submitted To:

BOSTON REDEVELOPMENT AUTHORITY
One City Hall Square
Boston, Massachusetts 02201

Submitted By:

NEB

NEW ENGLAND BAPTIST HOSPITAL
125 Parker Hill Avenue
Boston, Massachusetts 02120

HMM Associates, Inc.
A Summit Company

New England
Baptist
Hospital

125 Parker Hill Avenue
Boston, Massachusetts 02120

617 738-5800

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April 15, 1994

Ms. Beverly Johnson
Assistant Director for Institutional
Planning and Development
Boston Redevelopment Authority
One City Hall Square
Boston, MA 02201

Dear Ms. Johnson:

New England Baptist Hospital (NEBH) is pleased to enclose its Draft Project Impact Report (DPIR) for the Ambulatory Care Building and Parking Structure Project located on the NEBH's campus in the Mission Hill neighborhood. NEBH proposes to construct a 72,000 square foot, three story Ambulatory Care Building and a 422 car, 4 and 1/2 level Parking Structure. The Ambulatory Care Building will house outpatient diagnostic and treatment facilities, physician offices, and related patient support services.

NEBH has also proposed to the City of Boston Parks and Recreation Department that the "Fourth Tier" portion of the adjacent McLaughlin Playground be landscaped along with a portion of the hospital owned meadow at the eastern edge of the NEBH campus. The hospital is working with the City of Boston's Parks and Recreation Department and the community to design these landscape improvements which the hospital proposes to undertake as a part of the Project in order to create a large, pastoral area for passive recreational purposes.

As part of the Project, a new entranceway to the NEBH campus will be created from Parker Hill Avenue in order to establish improved access to NEBH facilities and the new Parking Structure. The existing primary entrance to the NEBH campus will be eliminated, landscaped, and returned to open space.

We wanted to thank you and your staff for assisting us in completing the attached DPIR under Article 31 and look forward to completing the permitting requirements and to initiating the construction of this important project.

Sincerely,

Gary E. Reed

Gary E. Reed
Vice President
Support Services

New England Baptist Hospital
Ambulatory Care Building/Parking Structure Project

145 Parker Hill Avenue
Boston, Massachusetts

Draft Project Impact Report

April 1994

Submitted to:

Boston Redevelopment Authority
1 City Hall Square
Boston, Massachusetts 02201

Submitted by:

New England Baptist Hospital
125 Parker Hill Avenue
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EXECUTIVE SUMMARY

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1. INTRODUCTION

New England Baptist Hospital (NEBH), a not-for-profit, non-sectarian, acute care, tertiary referral hospital at the top of Parker Hill in the Mission Hill section of Boston, is proposing to meet its needs for ambulatory care, a growing need throughout the health care industry, and for additional parking to serve its existing and future campus needs.

2. PROJECT SUMMARY

NEBH proposes to construct a 72,000 square foot, 3 story Ambulatory Care Building with basement and a 422-car, 4½ level Parking Structure (the "Project"). The Project will be located on a 205,000 square foot (4.7 acre) site on the Hospital's campus and includes open Hospital land partially occupied by surface parking. The Hospital is also working with the City of Boston's Parks and Recreation Department and the community to design an extension of the proposed landscape improvements which the Hospital plans to undertake as part of the Project on the meadow at the eastern boundary of its campus, to the "Fourth Tier" of adjacent McLaughlin Playground, in order to create a large, pastoral area for passive recreational purposes (see Figure E.1).

The Hospital has concluded that the best location for the new on-campus Ambulatory Care Building is in the open area of its main campus, to the east of the existing Fogg Building. The new building will be set back approximately 50 feet from Parker Hill Avenue and will be physically linked to other buildings within the NEBH campus by a covered walkway to be constructed as part of the Project. The site also has the advantage of adjacent parking facilities as described below. The Ambulatory Care Building will house outpatient diagnostic and treatment facilities, accessory physician offices and related patient support services. The height of the building will be 51 feet above grade on the south facade and 60 feet on the north facade.

Patients using the Ambulatory Care Building will require convenient parking. The trend toward ambulatory services, and the Hospital's commitment to responding to that trend, will increase the demand for convenient parking. The Hospital is planning to address this demand through construction of a new Parking Structure for approximately 422 cars as part of the Project on a portion of the existing Parking Lot G, which currently serves patients and visitors to the Hospital. Approximately 145 of the existing parking spaces in that lot will be eliminated by construction of the Project, so that a total of approximately 277 new parking spaces will be created by the Project. The

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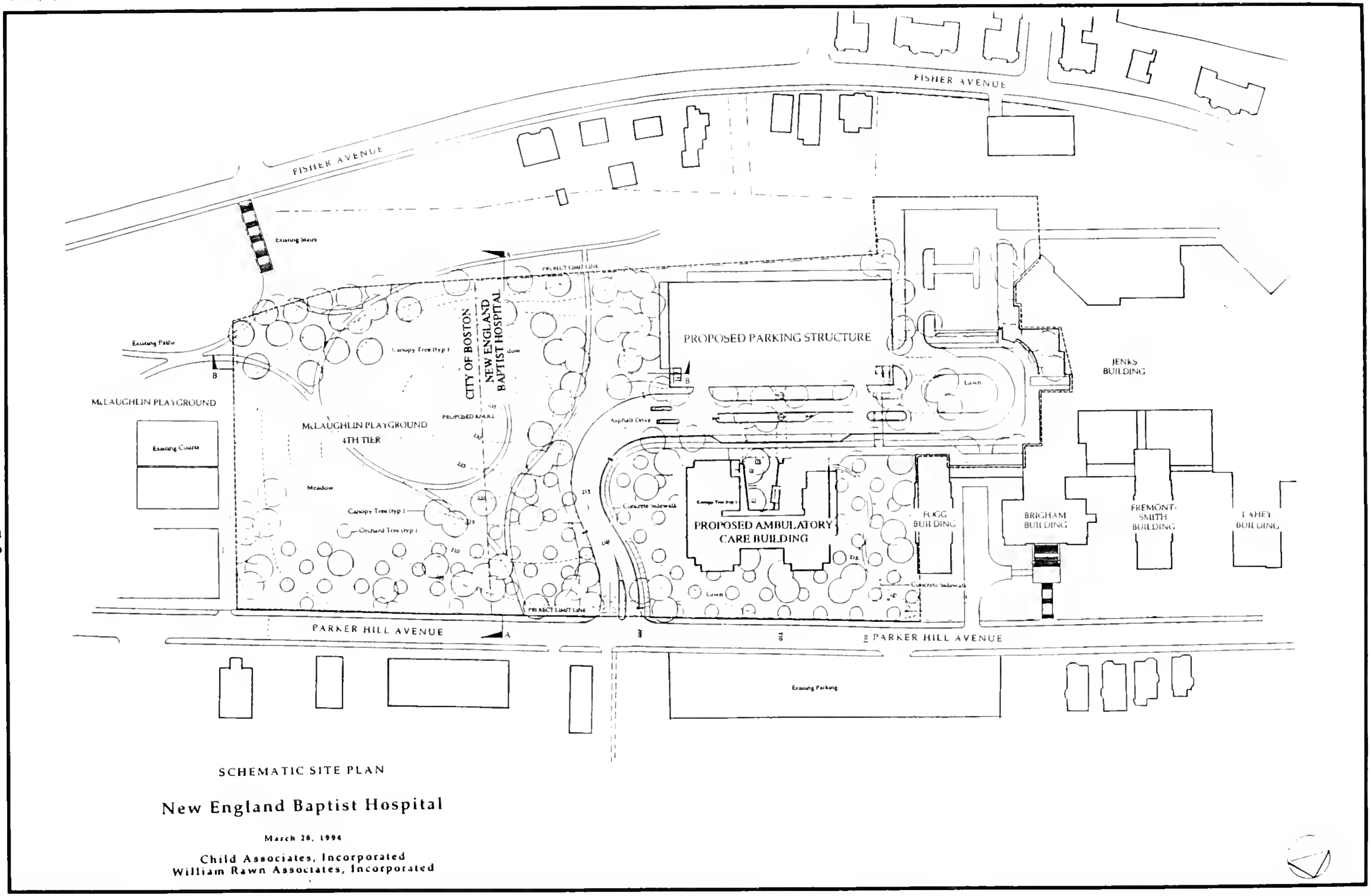

FIGURE E.1
AMBULATORY CARE BUILDING
& PARKING STRUCTURE PROJECT

Parking Structure will have direct access to the new Ambulatory Care Building by means of an underground connection. The Parking Structure will be 4½ levels, three above grade and one and one-half levels either at or below grade. The height of the Parking Structure parapets will be 23 feet along its northern edge, and 35 feet (maximum) along its sloping southern edge. The increased elevation on the southern edge is due partly to a lower grade elevation on this side.

In addition to the Parking Structure to be constructed in conjunction with the Ambulatory Care Building, the Hospital plans to acquire an existing commercial parking lot located at Terrace and New Heath Streets, approximately ½ mile from the Hospital's campus, to serve as a satellite parking lot for approximately 120 employee vehicles. If acquired, this lot will be available for use in September 1994, to coincide with initiation of construction of the Project. A Hospital shuttle van will transport employees to and from this satellite lot. The lot will have an on-site attendant, and the planned capital improvements include improved lighting, additional landscaping, and a new guard house. Access to the lot will be through the existing driveway on New Heath Street. The Hospital will eventually phase out use of its existing satellite lot in Jamaica Plain, which accommodates approximately 120 employee vehicles.

It should be noted that the Hospital will continue to address the issue of parking through an on-going, multi-faceted transportation management strategy that involves parking demand management and continued support of carpooling and the use of public transportation by Hospital employees, staff, and visitors. These efforts are discussed in the Transportation Mitigation Measures presented in Chapter 3.0 of the Transportation Component and Transportation Access Plan.

The third element of this Project is the creation of extensive landscape improvements in the area to the east of the proposed Parking Structure, encompassing not only a portion of the existing meadow on the Hospital's campus which includes a remnant summit of an historic drumlin, but a portion of adjacent McLaughlin Playground as well (the "Fourth Tier"). The central idea of the proposed landscape improvements is to recall the historic character of "The Great Hill" through the creation of a large, passive recreation area of more than five acres in size that includes extensive plantings of shade and orchard trees, and pedestrian paths. The proposed earth-moving required to accomplish this new landscaping consists of relocating approximately 40,000 cubic yards of fill, excavated from the new Ambulatory Care Building and Parking Structure areas to create a new knoll. The knoll will heighten the present summit by 15 feet to a new elevation of 235 feet and will extend the

existing meadow on Hospital land to encompass the entire Fourth Tier. All fill materials will be properly compacted and covered with 12" of previously stripped and stockpiled top soil. All excavated fill and top soil will be properly tested to ensure quality, and will conform to Boston Parks and Recreation Department Standards.

Creation of this large passive recreation area would not only address an unmet neighborhood need previously identified by the City's Parks and Recreation Department, but also provide an opportunity to re-create connections to urban pathways that have become overgrown from lack of maintenance. Urban pathways that could be re-created include:

1. A walkway which creates a direct link from the Fisher Avenue stairs directly south of the proposed Parking Structure location to the sidewalk adjacent to the new entry drive to the Hospital, thereby facilitating access through the Hospital's campus from Fisher Avenue to Parker Hill Avenue;

2. A walkway from Parker Hill Avenue to the new open space to be created in the Fourth Tier; and

3. Re-establishment of the former Oswald Street, directly east of the Hospital's Parking Lot F to serve as a pedestrian connection between Parker Hill Avenue and Iroquois Street.

Implementation of the Fourth Tier improvements in conjunction with the Hospital's adjacent meadow and creation of the urban pathways would be contingent upon concurrence of the City's Parks and Recreation Department and the community, and would be funded by the Hospital at an estimated cost of over $100,000. In addition, the Hospital proposes to put in place a 1V-year conservation easement on the meadow area within its campus, in order to ensure its continued availability as a passive recreation area. NEBH has also proposed to execute a Cooperation Agreement with the City under which it would commit to continuing its annual maintenance of McLaughlin Playground for ten years, and to assume responsibility for annual maintenance of the improved Fourth Tier as well. The estimated value of these in-kind contributions would be at least $500,000 over the ten year period.

As part of the Project, a new vehicular entranceway to the NEBH campus will also be created from Parker Hill Avenue, in order to create direct access to NEBH facilities and the new Parking Structure. The existing primary entrance to the NEBH campus will be eliminated, landscaped, and returned to open space with a direct pedestrian walkway to the Hospital established from Parker Hill Avenue in the alignment of the former site access driveway.

3. PUBLIC REVIEW PROCESS

NEBH has voluntarily agreed to have the Project publicly reviewed pursuant to Article 31 of the Boston Zoning Code. In conjunction with this review, NEBH submitted a Project Notification Form to the BRA in December 1993, and the BRA issued a Scoping Determination for the Project Impact Report in January 1994. In accordance with the Article 31 process, the anticipated development review schedule for the Project is as follows:

- *April 1994* - NEBH submission of Draft Project Impact Report (DPIR) to the BRA and initiation of 30-day public comment period

- *April/May 1994* - BRA and Community Review of DPIR

- *May/June 1994* - BRA issuance of Preliminary Adequacy Determination; NEBH submission of Final Project Impact Report and initiation of 30 day public comment period

- *May/June 1994* - BRA Board Review of the Project

- *June/July 1994* - BRA issuance of Final Adequacy Determination; Board of Appeal action on applications for conditional use and Interim Planning Overlay District permits.

It is anticipated that BRA Board action on NEBH's Institutional Master Plan, which is being publicly reviewed concurrently with the Project, will occur concurrently with the BRA Board's action on the Project.

Parks Commission approval will also be sought for construction of the Project within 100 feet of McLaughlin Playground, and for the proposed improvements to the Fourth Tier.

4. SUMMARY OF ENVIRONMENTAL EFFECTS

The following sections summarize potential environmental effects of the NEBH Ambulatory Care Building and Parking Structure Project.

4.1 Transportation Parking and Circulation Impacts

Impact of new traffic on intersections studied is minimal in the 1998 Build year and Project occupancy date with a slight change in levels of service (LOS) at only the Tremont Street/Parker Street intersection where LOS C in the PM Peak Hour (5:00 - 6:00 PM) declines to D, brought on by a 1/3 second increase in traffic delay, which is negligible. The parking demand resulting from increases in the number of employees and physicians/patients/out-

patients is expected to increase by 167 spaces before any new parking mitigation measures are undertaken to reduce demand as discussed in Chapter 3.0, the Transportation Component and Transportation Access Plan.

Pedestrian impacts will not be significant because of the limited accessibility of the Hospital to walkers and the use by an out-patient population who will generally arrive by automobile.

The proposed relocation of the site access drive to the east of the present drive will maintain appropriate site distances on Parker Hill Avenue and will also reduce the more severe grade of the existing driveway.

Transportation mitigation measures to be utilized by the Hospital to reduce single occupancy vehicle use by Hospital employees include the following demand management incentives: (1) educate employees; (2) promote mass transit; (3) promote ridesharing; (4) establish alternative work hours; and (5) encourage walking/cycling. In addition, roadway improvements will be considered at the Parker Hill Avenue/Sachem Street intersection to improve turning radii and site distances for automobiles using Sachem Street and Parker Hill Avenue. Periodic and long-term Project monitoring will be implemented in accordance with the requirements of Article 27M of the Boston Zoning Code.

4.2 Wind

A qualitative assessment of pedestrian level winds (PLWs) was completed to determine the effect of the Project on pedestrian level winds at all proposed entrance and drop-off areas.

Since the site is on top of the 225 foot sharply rising Parker Hill, it is naturally windy. Currently, no location in or near the site is believed to exceed the BRA Guideline wind speed,* nor is any location believed to have winds at Melbourne's Category 1 (dangerous or unacceptable) or 2 (uncomfortable for walking).** The addition of the proposed structures will have no effect or will reduce winds at the locations studied. The two new structures will also have no effect on winds along nearby Sachem and Iroquois Streets, and Fisher Avenue.

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* Since the early 1980's Boston has used a guideline criteria for acceptable winds of not exceeding 31 mph effective gusts more often than once in 100 hours.

** In 1978, Melbourne developed a probability criteria utilized by the BRA to qualitatively describe average wind speeds and to relate it to different types of pedestrian activity as well as the safety aspects of such winds. The ratings used range from one to five with one being "dangerous and unacceptable" winds to five being "comfortable (winds) for long periods of standing or sitting."

This assessment has been made assuming the existence of only the existing trees on the site. The addition of the proposed landscaping should further reduce any windiness, and should be particularly effective on mitigating winds in the open area just east of the site.

4.3 Air Quality

A study was conducted to evaluate air quality impacts of the Project. The study provides a microscale analysis of motor vehicle emissions from project area roadways and the proposed Parking Structure.

The microscale analysis was conducted to evaluate the effect of project area traffic on carbon monoxide (CO) concentrations at sensitive receptors including some of the intersections evaluated in the transportation analysis (Chapter III), both with and without construction of the Project.

The results of the microscale analysis demonstrate ambient air quality standards for CO will be maintained with construction of the Project. Further, because the Project generates so few vehicles, the study demonstrated the Project has virtually no impact on air quality at the intersections evaluated.

4.4 Solid and Hazardous Waste

A preliminary environmental evaluation has been completed for the Project site. Previous sub-surface geological investigations were conducted in 1985 at the Project site.

In March 1994, HMM Associates performed a limited subsurface exploration program of current fill soils within the proposed building footprints. On the basis of these investigations, HMM concluded that there is no evidence of a significant petroleum product and/or hazardous materials release which would warrant reporting under the Massachusetts Department of Environmental Protection (DEP's) Massachusetts Contingency Plan (MCP), or present a health risk for children or adults. A Phase I Preliminary Site Assessment is currently in the process of being completed and additional evaluation of soils within the glacial till may be conducted as part of the Project's deeper geotechnical exploration program investigation if these soils are to be used for fill in meadow and Fourth Tier areas.

Solid waste generated by the Ambulatory Care Building will consist of typical office type waste, i.e., paper, cardboard, etc. NEBH estimates that the new building will generate approximately two tons of solid waste per month, which will be removed from the building every day and put into the Hospital's trash compactor.

Medical waste will be removed daily, stored in the Hospital's refrigerated infectious waste storage room located in the Lahey Building, and packaged, labeled and shipped three times per week, in compliance with all applicable regulations.

NEBH currently conducts a recycling program for paper products in an effort to reduce the amount of solid waste generation. This program will also be extended to include the new Ambulatory Care Building.

4.5 Noise

A noise modeling study was conducted to assess the potential effect of the construction and operation of the Project's mechanical and exhaust systems and compliance with applicable regulations of the City of Boston. A description of the Project's mechanical and exhaust systems and their location is included in this report, as are proposed measures to minimize and eliminate adverse noise impacts on nearby sensitive receptors. The analysis contains a discussion of the existing noise environment and estimates of the operational noise sources of the proposed Project.

The Hospital's existing mechanical and exhaust systems produce very little sound that can be measured beyond the property boundary. The Project will similarly produce little sound that can be measured beyond the property boundary. The expected levels have been quantified and compared to applicable standards in Chapter IV, Section 4.0. This analysis concludes that the noise from the Project is expected to comply with the City of Boston Noise Standards.

4.6 Geotechnical Impact

Previously collected geotechnical data indicate that the subsurface soil and water conditions are favorable for construction of the building foundations for the proposed Project. It is anticipated that reinforced concrete footing or mat foundations and soil-supported floor slabs-on-grade will be employed.

Excavations for foundation construction will range in depth from approximately 15 feet to 25 feet. Due to the favorable soil and water conditions and distance away from other structures, it is anticipated that essentially all of the excavation could be open-cut using conventional equipment and procedures.

As soil-supported footing foundations are anticipated, noise and vibrations which would be associated with installation of piles or other deep foundations will not occur.

As the lowest floors will be below finished exterior grade and possibly below maximum groundwater levels, measures will be required to eliminate or resist potential excess hydrostatic uplift pressures. Measures to avoid possible leakage into the below-grade structures will also be necessary.

Due to the likely low water levels and the relatively low permeability of the glacial till soils, construction dewatering requirements are not expected to be significant. Any dewatering can likely be accomplished with open sump pumping, and no adverse impacts on area groundwater levels are expected during construction. Similarly, no adverse impact on permanent area groundwater levels is anticipated.

Due to the competent nature of the site soils and the probable use of open-cut excavation methods, excavation-related movements of the ground outside the excavation sites are expected to be very small and not extend outside the limits of the Project site.

Additional evaluation of soils within the glacial till will be conducted as part of the deeper geotechnical exploration program analysis.

4.7 Construction Impacts

A Construction Management Plan (CMP) will be developed prior to the start of construction, and will include specific mitigation measures and staging plans to minimize effects on the adjacent meadow and Fourth Tier areas as well as on abutting property. The Project's Final Project Impact Report will contain more detail on the information to be contained in the CMP.

4.8 Urban Design

The design of the proposed new Ambulatory Care Building, Parking Structure, entry drive and associated landscape improvements at NEBH together will collectively respond to the following primary site conditions:

1. The current entry courtyard, probably the best of any local hospital, is fundamentally a positive experience which should be reinforced.

2. The entrance drive should enhance the experience of the open green area landscape as part of the Hospital entrance.

3. From the entry court, there are extraordinary views to Jamaica Plain and Boston's southwest neighborhoods.

4. From the proposed site for the Ambulatory Care Building, there are extraordinary views of downtown Boston.

5. The relationship of total building mass to open space at the Hospital campus should be maintained.

Specific design concerns addressed in the Ambulatory Care Building and Parking Structure components as well as landscape improvements are discussed in the following paragraphs.

Ambulatory Care Building

In keeping with the historic nature of building materials on the Hospital campus, the Ambulatory Care Building will have brick facades with stone highlight features. The proposed floor-to-ceiling glazing in the courtyard of the Ambulatory Care Building will continue a tradition of fully-glazed hallways connecting buildings on the Hospital campus. The entrance canopy to the Ambulatory Care Building will serve as a protective cover for those entering the building, while enhancing the image of the Hospital as a bucolic, garden-like campus.

Parking Structure

The Parking Structure has been designed so that three of the four facades have flat or level floors behind them; the only sloping floors occur on the south facade which is not visible from Parker Hill Avenue and the meadow. This assures that the visible facades will not look like parking structure walls but instead like garden walls or the walls of other Hospital structures. The Parking Structure will have brick facades on all four sides, with stone highlight features. While the south facade will appear one floor higher to abutters on Fisher Avenue, this side of the structure will be heavily landscaped and will also be at a minimum approximately 130 feet from the closest residence.

Landscape Improvements

The proposed landscape improvements will lead to the creation of a large, passive recreation area of more than five acres in size containing extensive plantings of shade and orchard trees and pedestrian paths, which will address unmet neighborhood recreation needs as well as recreate pedestrian connections within the Mission Hill neighborhood that have become overgrown from lack of maintenance.

4.9 Historic Resources

A review of Boston Landmark Commission and Massachusetts Historical Commission files was conducted to identify noteworthy buildings or districts

in the Project vicinity: one building and one district are listed on the National Register of Historic Places.

There are no resources on the National Register adjacent to the site. The nearest structure that is listed on the National Register of Historic Places is the Hoxie House on Hillside Street, approximately 600 feet to the north of the Project site. This house will not be impacted by the Project. The nearest historic district that is listed on the National Register is the Mission Hill Triangle District, located approximately 1,500 feet to the north of the Project site.

An evaluation of the Project with regard to its proximity to noteworthy historic buildings or districts within the project vicinity indicates that, with the exception of the Hospital's original Robert Breck Brigham Building, there are no historic resources near enough to the Project to be potentially affected by it. The Robert Breck Brigham Building, which is adjacent to the Project site, will be provided an improved architectural setting by the new Project. The Ambulatory Care Building will maintain a similar setback from Parker Hill Avenue as well as respect existing side yard setbacks that frame existing Parker Hill Avenue buildings. The Project will also not affect access or views of the other historic properties previously identified in any way.

Based on research conducted at the office of the Massachusetts Historical Commission, there are no known archaeological resources on-site, or within one-half mile of the site, although a portion of the former Parker Hill Reservoir was located on the site of McLaughlin Playground until the 1930's. Therefore the Project is not anticipated to impact any archaeological resources.

4.10 Infrastructure

Domestic water demand for the new Ambulatory Care Building is estimated to average approximately 10,800 gallons per day (gpd). This estimate is based on actual water use data obtained from a similar medical and research facility rate of 200 gallons per 1,000 square feet of medical area. The peak flow rate for the Project is estimated to be 22.5 gallons per minute (gpm) based on a peaking factor of 3.

Process water use is estimated to average approximately 7,750 gpd and is limited to makeup water requirements for the cooling tower when the tower is in operation. The cooling tower is expected to be operated during moderate and warmer months of the year (roughly April through September) The tower's peak water consumption during operation is approximately 17,350 gpd (12 gpm) based on the evaporative heat content of water (12,000 Btu/ton of

refrigeration) and blowdown resulting from 5 cycles of concentration (typically 20% of total makeup water requirements).

Based on recent hydrant test data for the project vicinity, sufficient system capacity is available. The Boston Water and Sewer Commission has indicated that no system problems in the area have been identified and that sufficient capacity is available to meet project requirements.

The majority of wastewater generated by the Project will be associated with sanitary uses. Average sanitary sewage generation for the Ambulatory Care Building is estimated to be approximately 9,720 gpd, based on a 10% reduction of the average water consumption estimates calculated for the Project. Peak sanitary discharge is expected to be approximately 20.25 gpm, based on a 10% reduction of the peak water consumption estimates calculated for the Project. Average process wastewater discharged to the sewer is estimated to be approximately 1,550 gpd, while peak process wastewater discharged to the sewer is expected to be approximately two gpm. These estimates are based on a cooling tower blowdown rate of approximately 20% to total makeup water requirements.

Chemical and biological waste will be collected and disposed of in compliance with applicable regulations. Liquid entering into the sanitary drainage system will meet all standards for effluent discharges. Laboratory drainage systems will be equipped with automatic treatment systems to control pH and for metals removal where required. Treatment system specifications will be fully detailed in subsequent filings with the MWRA Heating for the Ambulatory Care Building will be provided by the existing Hospital boiler facility. Based on typical energy requirements for similar facilities, heating for the Project will total approximately 3.5 million Btu/hour.

Cooling requirements for the Ambulatory Care Building will be provided by a high efficiency centrifugal liquid type chiller, expected to be approximately 400 tons, and to be located in the nearby Jenks Building.

The Hospital's existing power source (Boston Edison) will be used to provide power for the Project. It is estimated that an additional 560 kW of power requirements will be imposed on the existing Hospital's primary electric source.

Main electric service will consist of new dual underground 13.8 kV primary electric service extended from the existing New England Baptist Hospital primary electric switchgear located in the existing boiler plant. A new duct will be extended from the existing primary electric service manhole located

adjacent to the Jenks Buildings to a new unit substation in the Ambulatory Care Building.

I. GENERAL INFORMATION

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1.0 APPLICANT INFORMATION

1.1 Project Identification

Project Name:	**New England Baptist Hospital Ambulatory Care Building and Parking Structure Project**
Location/Lot Size/ Ownership:	The Project site ("site") is located at 145 Parker Hill Avenue at the top of Parker Hill in the Mission Hill section of Boston, Massachusetts. The site is on the Hospital's central campus, which is bordered by Parker Hill Avenue, Fisher Avenue, and a portion of the McLaughlin Playground, a City park. The Hospital owned portion of the site consists of 205,000 square feet (approximately 4.7 acres) of land, including the Hospital-owned open meadow. The site also includes a 99,004 square foot (2.25 acres) City owned open green area (known as the "Fourth Tier"), which is currently undeveloped and sparsely planted, and may be landscaped as part of the Project, subject to the concurrence of the City's Parks and Recreation Department and the community. The site includes the highest elevation in the Mission Hill neighborhood. Figure I.1-1 shows the general location of the site.
Existing Uses:	A portion of the site is currently used as surface parking (NEBH Lot G) for 185 vehicles; the remaining portion is undeveloped.

1.2 Development Team

Owner/Developer:	New England Baptist Hospital 125 Parker Hill Avenue Boston, Massachusetts 02120 Mr. Gary E. Reed Vice-President, Support Services

FIGURE I.1-1
SITE LOCUS MAP

HMM Associates, Inc.
A Summit Company

Legal Counsel:	Goodwin, Procter & Hoar Exchange Place 53 State Street Boston, Massachusetts 02109-2881 Mr. Lawrence E. Kaplan, P.C. Ms. Rebecca A. Lee, Esq.
Development Manager:	Northland Advisors, Inc. 2150 Washington Street Newton, Massachusetts 02162 Mr. William J. Hunt, Jr., Vice President Commercial Development
Architect:	William Rawn Associates, Architects, Inc. 101 Tremont Street Boston, Massachusetts 02108 Mr. William Rawn, AIA Mr. Douglas C. Johnston, AIA Mr. David A. Yosick
Landscape Architect:	Child Associates 240 Newbury Street Boston, Massachusetts 02116 Ms. Susan Child Mr. Robert Corning
Master Plan Architect:	Marsters & Sargent Architects Inc. 1249 Boylston Street Boston, Massachusetts 02215 Mr. Timothy Marsters, AIA
Environmental and Transportation Consultant:	HMM Associates, Inc. 196 Baker Avenue Concord, Massachusetts 01742 Mr. Mitchell L. Fischman, AICP Ms. Jill H. Reynolds Mr. Barry Porter, AICP

Wind Consultant:	Frank Durgin, P.E. c/o Wright Brothers Wind Tunnel Building 17-110 Massachusetts Institute of Technology Cambridge, Massachusetts 02139
Mechanical Engineer:	TMP Consulting Engineers, Inc. 52 Temple Place Boston, Massachusetts 02108 Mr. Richard Zaccone Mr. Roger Wardwell
Electrical Engineer:	Lottero & Mason Associates, Inc. 132 Lincoln Street Boston, Massachusetts 02111 Mr. William Henney
Structural Engineer:	LeMessurier Associates 1033 Massachusetts Avenue Cambridge, Massachusetts 02138 Mr. Peter Cheever
Geotechnical Engineer:	Haley and Aldrich, Inc. 50 Charles Street Cambridge, MA 02141 Mr. Steven B. Kramer
Civil Engineer:	H.W. Moore Associates, Inc. 112 Shawmut Avenue Boston, Massachusetts 02118 Mr. Robert Carter

1.3 Legal Information

1.3.1 Legal Actions Pending Concerning the Proposed Project

NEBH is not aware of any legal actions pending or any legal judgments that have been rendered that would affect the development of the Project.

1.3.2 Evidence of Site Control Over the Project Area

The Project will be developed on a 205,000 square foot portion of NEBH's campus, which comprises a total of approximately 820,000 square feet of land area. NEBH owns its entire campus in fee. In addition, a 99,064 square foot (2.25 acres) open green area adjacent to the site owned by the City of Boston, and referred to as the Fourth Tier portion of McLaughlin Playground, may be landscaped as part of the Project, subject to concurrence of the City's Parks and Recreation Department and the community.

1.3.3 Public Easements

There are no public easements into or through the site; however, there are utility easements located in public ways adjacent to the NEBH campus, to which the NEBH utility lines are connected.

2.0 FINANCIAL INFORMATION

2.1 Financial Assistance

No additional financing from governmental agencies or programs is being sought at this time.

2.2 Preliminary Development Budget

The following is a breakdown of the Preliminary Development Budget for the Project:

Construction	$15,513,329
Architectural/Engineering	$1,349,959
Soft Costs	$2,574,801
Reserves	$1,583,090
Total Preliminary Development Budget	**$21,021,179**

3.0 PROJECT AREA

3.1 Hospital Site

The Project will be developed on a 205,000 square foot portion of NEBH's campus, which comprises a total of 820,000 square feet of land area. The site includes the Hospital's open green area (the "meadow") to the east of the existing parking lot, as well as a portion of the City of Boston's McLaughlin Playground (the Fourth Tier, as referenced in Section 3.2 below.) The Project site address will be 145 Parker Hill Avenue in Boston, Massachusetts. A survey plan is currently being prepared by Harry R. Feldman, Inc. of the Hospital portion of the site, as well as a metes and bounds description of the site, which will be provided in the Final Project Impact Report.

3.2 City of Boston Site

The Hospital has initial discussions with the City of Boston's Parks and Recreation Department and the Mission Hill Planning and Zoning Advisory Committee (PZAC) to explore the possibility of "knitting together" a portion of the Hospital-owned meadow and the approximately 2.25 acre Fourth Tier portion of adjacent McLaughlin Playground. This concept involves extending the landscape improvements which NEBH proposes for a portion of the meadow into City-owned land, at Hospital expense, in order to create a large passive recreation area that contains ornamental and canopy trees, benches and walkways and allows its users to enjoy panoramic views of the City.

4.0 ANTICIPATED EMPLOYMENT LEVELS

4.1 Construction Jobs

Construction of the Project will provide temporary employment opportunities for Boston residents. It is estimated that during the peak construction period (during interior fit up in the later half of 1995), up to 100 construction workers may be employed. The construction period is expected to last approximately 16 months, from September 1994 to December 1995.

4.2 Permanent Jobs

In the long-term, NEBH expects that up to 77 new jobs may be created by the new Ambulatory Care Building portion of the Project. The recruitment of qualified Boston residents will be undertaken in accordance with a Cooperation Agreement between NEBH and the City to be executed in connection with the Project approvals.

5.0 PROGRAMS BENEFITING THE COMMUNITY

NEBH has been in the Mission Hill community for nearly a hundred years and recognizes that the health and strength of the Hospital is linked to the health and strength of its neighborhood. Therefore, the Hospital is committed to working with the community to identify programs and services which promotes the quality of life in the community.

The Hospital has created programs to provide:

- On-site and off-site healthcare services and healthcare information;
- Job training, employment and educational opportunities; and
- Support for maintaining the character and stabilizing the quality of life in Mission Hill.

Some of its existing programs, together with proposals for change and expansion, are described below.

5.1 Community Programs: Health Care Service

The Hospital currently runs a number of educational, outreach, screening and treatment initiatives and is working to expand and identify further methods to maintain and improve the health of its neighbors. The Hospital will continue to support ongoing healthcare programs, including:

NEBH Free Mammography Program/Celtic Wives Save Lives

- NEBH has committed to providing up to 1,000 free mammograms and follow-up care, if necessary, for women in Boston, including Mission Hill.

- NEBH, in partnership with the Celtics Wives, has recruited and trained Ambassadors from Mission Hill. These are women in the community committed to encouraging their friends, family and neighbors to practice breast health measures, including having mammograms.

Roxbury Heart Center (Prevention and Diagnostic Center)

- In a model partnership program, NEBH has joined forces with Roxbury Comprehensive Community Health Center and two other hospitals to open a community-based cardiac care center in the Spring of 1994.

- NEBH will contribute one-third of the Roxbury Health Center's first year operating expenses, at a cost of approximately $175,000.

Blood Pressure Screening at Action for Boston Community Development (ABCD): Parker Hill/Fenway Service Center

- NEBH provides on-going blood pressure screening for senior citizens in Mission Hill.
- NEBH provides on-going support for the Senior Center including donating time of nurses, pharmacists and nutritionists.

Blood Pressure Screening for Mission Church Senior Group

- NEBH provides on-going blood pressure screening for senior citizens in Mission Hill.

Seniors Health Fair at Mission Park

- NEBH provides an annual health fair for senior citizens in Mission Hill, including blood pressure and cholesterol screening, and counseling by pharmacists, dietitians, physical therapists, social workers and members of the ministry.

Immediate Care Center at New England Baptist Hospital

- The Center provides immediate care for medical emergencies, excluding trauma, without the delay associated with most emergency rooms.
- The Center affords members of the community ready access to the services of NEBH.

Skin Cancer Screening

- NEBH provides annual free skin cancer screening to the community.

Ask-A-Nurse Health Information Line

- NEBH is the only Boston hospital sponsoring this free 24-hour health information line, which averages about 24,000 calls per month.

In addition, the Hospital proposes to develop, and expand the following programs:

Free Healthcare Screening in Mission Hill

- NEBH will explore expanding the types of free healthcare screenings provided for the community, using available community needs

assessments. NEBH will also work to develop a program of outreach and counseling surrounding its newly open Arthritis Clinic.

NEBH/Celtics Wives Free Mammography Program

- NEBH will continue to publicize this service in Mission Hill and will work to recruit more Ambassadors from Mission Hill churches, community centers and organizations.

The Immediate Care Center

- NEBH will use the forums of its current and future screening programs to increase the visibility and awareness of the Immediate Care Center in Mission Hill.

5.2 Neighborhood Involvement: Maintaining the Mission Hill Neighborhood

New England Baptist Hospital recognizes that its neighbors are not only businesses or institutions, but in large part, people who make Mission Hill their home. NEBH works to maintain and collaborate to improve the quality of life in the community through support of and participation in its community-based organizations, addressing the needs of youth, families and senior citizens in Mission Hill.

NEBH will continue to support the community programs described below:

Mission Link Bus

- NEBH has donated $35,000 per year (approximately one-third of the operating cost) for this neighborhood bus service for Mission Hill residents since 1987. NEBH has supported this service financially since 1976.

McLaughlin Playground

- NEBH returned a parking lot formerly located on the Fourth Tier of the McLaughlin Playground to open space use in 1991, at a cost of $25,000.

- NEBH provides for annual maintenance of McLaughlin Playground in accordance with City standards, at an annual cost of approximately $35,000.

- NEBH donated materials for new bleachers to support the Mission Hill Little League.

Mission Hill Community Center

- NEBH serves on the Mission Hill Community Center Board.
- NEBH provides food, supplies and other support when needed, including supplies for medical kits for each site, and the design and layout services for publicity materials.
- NEBH provides sports medicine clinics for the Mission Hill Sports Camp.

Mission Possible Summer Camp

- NEBH provides staff training in basic first aid and medical kits for each summer.
- NEBH participates in role model sessions.
- NEBH provides food, supplies and other support when needed.
- NEBH promotes fundraising activities in the NEBH newsletter.

Action for Boston Community Development (ABCD); Parker Hill/Fenway Branch

- NEBH serves on the ABCD Advisory Board.
- NEBH provides support, both monetary and in-kind, for social events, including sponsoring summer and winter dinner dances for Mission Hill senior citizens.

Project LIFE/Project to VIDA (Lowering Infant Fatality through Empowerment)

- NEBH serves on the Board of Directors of this agency, which fights infant mortality in Mission Hill.
- NEBH collaborated on a free mammography program at the Hospital by recruiting two Ambassadors from the agency's "Empowering Peers" program.
- NEBH provides periodic health programs such as nutrition counseling and cholesterol and blood pressure screening.
- NEBH provides food, supplies and other support when needed.

Longwood Medical Area/Mission Hill and Fenway Food Project

- NEBH is an Advisory Board member.
- NEBH participates in the annual canned food drive to support the ABCD Parker Hill/Fenway Food Pantry in Mission Hill.

Mission Hill Little League

- NEBH donates medical kits for first aid.
- NEBH made in-kind contributions for the construction of bleachers. (This is also identified in the "McLaughlin Playground" discussion).

Mission Hill Crime Committee

- NEBH donates printing services and meeting space when requested.

Mission Hill Neighborhood Housing Services

- NEBH provides printing services for the NHS Newsletter.

Back of the Hill Townhouses Condominium Association

- NEBH provides meeting space and refreshments for Association meetings.

Carol DiMaiti Stuart Foundation

- NEBH was the first institution in the Mission Hill/Longwood Medical Area to launch an employee fundraising drive for this foundation.

Mission Hill Theatre

- NEBH helps publicize this theater group's productions and provides props when needed.

Alcoholics Anonymous

- NEBH hosts weekly meetings for two Mission Hill groups.

Voter Registration Drives

- NEBH supports voter registration drives in the Mission Hill community through publicity services and in-kind donations.

Mission Hill Road Race

- NEBH supports the Mission Hill Road Race with in-kind contributions.

Mission Hill Knights of Columbus

- NEBH supports activities of the Knights of Columbus in Mission Hill, including an annual Thanksgiving dinner for neighborhood senior citizens.

Healthy Boston

- NEBH supports this coalition-building initiative of the City to promote public health in Boston's medically-underserved communities.

Neighborhood Safety

- NEBH's security personnel regularly patrols the NEBH campus, as well as adjacent residential areas.

In addition, the Hospital is willing to develop or enhance the following programs.

Promotion of Housing Opportunities in Mission Hill

NEBH will continue to support the marketing of housing opportunities on Mission Hill through several avenues, including:

- Continued support of the *NHS News,* which promotes affordable housing opportunities on the Hill.

- Publication of articles about the community in its employee newsletter.

Crime Prevention and Neighborhood Safety

NEBH will work with the Mission Hill Crime Committee on community initiatives like *Streetsafe* and will continue to maintain a security presence around the Parker Hill area.

Parking Management and Transportation Plans

NEBH's proposed Parking Structure will help alleviate the Hospital's parking deficit, but will not eliminate it. Therefore, the Hospital will continue working with the community to find mutually acceptable solutions to neighborhood parking and transportation concerns.

Support of Off-Site Parking and Use of Mass Transportation

NEBH will continue to encourage and work to expand support of the use of mass transportation and off-site parking in the following ways:

- NEBH is negotiating to lease a parcel on Terrace Street to provide off-site employee parking.
- NEBH will continue its shuttle service to and from the Orange Line.
- NEBH will continue to support the Mission Link.
- NEBH will expand its T-Pass Program and encourage walk to work initiatives.
- NEBH will support residential parking initiatives and traffic safety initiatives as the need is indicated by the community. For example, signage indicating children playing at McLaughlin Playground is one need that has been identified by area residents.
- NEBH will work with community to develop solutions to issues identified by its neighbors - for instance the Sachem Street/Parker Hill intersection - in conjunction with the development of a transportation plan for the Mission Hill neighborhood pursuant to Article 27M of the Boston Zoning Code (Mission Hill Interim Planning Overlay District).

Continued Maintenance of McLaughlin Playground

- NEBH has committed significant resources and staff time to improve and maintain McLaughlin Playground.
- NEBH will commit to continuing the maintenance of McLaughlin Playground in accordance with the Parks and Recreation Department standards.

NEBH would like to work with the community on other neighborhood recommendations and proposal ncluding:

Streetscape Enhancement

- NEBH will enhance parking areas. After completion of its Parking Structure, NEBH will landscape its current parking lots to reduce their visual impact on the community, especially for its closest neighbors.
- NEBH will complete landscaping improvements along Parker Hill Avenue to create a tree-lined, unified approach to the Hospital.

Pathway Enhancement

- NEBH will work with the community on enhancing the pedestrian pathway system in Mission Hill, based the community's wishes.

The Fourth Tier of McLaughlin Playground

- NEBH will work with the Mission Hill community and the City's Parks and Recreation Department to develop a final plan for the Fourth Tier that is acceptable to the community and affordable by the Hospital.
- NEBH will landscape the Fourth Tier in accordance with the agreed-upon final design.
- NEBH will enter into a maintenance agreement with the City for this area, in addition to the portion of McLaughlin Playground that the Hospital already maintains.
- NEBH will place a conservation easement on the meadow area located on its campus.

5.3 Education, Job Training and Employment Opportunities

Over the past five years, employment figures for New England Baptist Hospital have remained steady. NEBH currently has 1,200 employees, of which approximately 500 are Boston residents, and twenty percent of those are residents of Mission Hill.

The Hospital is committed to promoting employment opportunities for Boston - and specifically Mission Hill - residents through support of job training programs for high school students and adults. Programs are also offered to employees for career advancement. Promotion of employment opportunities incl the provision of scholarships for further education in healthcare

careers and distributing job listings to central locations in community agencies around the Hill.

NEBH will continue to support the education, job training and employment efforts already implemented as described below:

Project ProTech - Boston Private Industry Council (PIC) School-to-Work Program

- NEBH works with students from junior year in high school through two years post-graduate education as part of the School-to-Work Program for Boston Public High School students.
- NEBH provides on-site instruction and employment training to Boston Public School students interested in health careers.
- NEBH provides after-school and summer jobs for Boston Public School students and book scholarships for college students.
- Currently, two college students and ten high school students are employed in part-time jobs at the Hospital.
- NEBH has played an active role in development of the program's curriculum and in the recruitment of other hospitals to participate in the program.
- NEBH participates in the Boston PIC Summer Jobs Program.

Farragut Elementary School in Mission Hill - Business Partner

- NEBH works with teachers from the Farragut Elementary School to improve science programs, provide role modeling presentations, present nutrition and hygiene programs, host school tours, and to provide reading and tutoring volunteers.

Job Listings

- NEBH sends job listings for openings at NEBH twice a month to Mission Hill community groups and to City and State representatives.

Dimock Community Health Center

- NEBH is a clinical site for the Central Sterile Supply and Operating Room Technician health vocational training programs at the Dimock Community Health Center.

- NEBH contributed funds for the renovation of a classroom at the new Job Training Center at Dimock.

- NEBH supports the "Stepping Out" annual fundraising event for Dimock.

School of Nursing Scholarships

- Since 1985, NEBH School of Nursing has awarded 59 scholarships to Boston Public School graduates:

  1993-94 - 7 scholarships
  1992-93 - 6 scholarships
  1991-92 - 8 scholarships
  1990-91 - 6 scholarships
  1989-90 - 9 scholarships
  1988-89 - 8 scholarships
  1987-88 - 6 scholarships
  1986-87 - 5 scholarships
  1985-86 - 4 scholarships

Other Scholarships

- ***Bunker Hill Community College Medical Radiographer Scholarship*** - NEBH provides full tuition, fees, and books for a full-time two year enrollment, or three-year part-time program. Part-time employment can be arranged while attending the program.

- ***Medical Technologist*** - NEBH provides a scholarship in conjunction with New England Deaconess Hospital's School of Medical Technology.

- ***Physical Therapy Scholarship*** - NEBH provides this scholarship annually, which is awarded to cooperative program students at Northeastern University.

English as a Second Language (ESL) Course for Employees

- NEBH offers an ESL course to its employees and has sought and received State funding to offer this program during work hours.

Boston High School Shadowing/Mentor Programs

- NEBH provides mentors for students from Dorchester High School and Madison Park High School who participate in the program.

Black Achiever Program

- Since 1986, NEBH has participated in this recognition and community service linkage program.

Morgan Memorial/Goodwill Industries Work Programs

- NEBH serves on the Employee Advisory Board.
- NEBH employs special needs clients in supported work programs when possible.
- NEBH serves as a Back to Work site for Morgan Memorial clients re-entering the labor force.
- NEBH has played an active role in curriculum development and training.

Clinical Internships

- NEBH provides clinical and professional internships in physical therapy, radiology, social service, nursing, pharmacy, dietary services, lab, hospital administration and theology to students from Northeastern University, Massachusetts College of Pharmacy and Allied Health Sciences, Framingham State College and other institutions.

Health Awareness Day

- New England Baptist Hospital School of Nursing participates in this day-long program of educational activities for Tobin Grammar School children.

Safe Sitter Program

- NEBH is a training site for the Safe Sitter program, which is aimed at helping adolescents combat preventable accidents while they are caretakers. NEBH also obtains financial aid for low-income students to participate in the program.

In addition, the Hospital proposes to develop, and expand the following:

Scholarships to the School of Nursing

- Efforts will be made to increase the Mission Hill community's awareness of scholarship opportunities at NEBH's School of Nursing by asking current nursing students to participate in community health screenings and programs, and expanding current tutoring programs conducted by the School of Nursing for Mission Hill children.

Job Training Programs

- NEBH is currently seeking a grant to offer a Basic Skills program to its employees in the fall of 1994. If NEBH receives the grant, it plans to offer a number of slots, as available, to community residents and will work with the appropriate social service and community agencies to identify persons who might benefit from this program.

Job Listings

- The Hospital currently circulates job listings and provides a job posting board in the Hospital. In order to enhance the ability of Mission Hill residents to learn about job opportunities at the Hospital, the Hospital would like to explore the possibility of donating its Human Resources staff time to take a morning a week, in rotation with the other hospitals in the Mission Hill/Longwood Medical Area, to be available in a central community location to discuss available job opportunities.

6.0 REGULATORY CONTROLS AND PERMITS

6.1 Zoning Relief Required for the Project

The Project site is located in an H-2 (Residential) District, pursuant to which institutional uses are conditionally allowed. Therefore, the Project will require a conditional use permit from the City of Boston's Board of Appeal.

The site is also located within the Mission Hill Interim Planning Overlay District (IPOD), established pursuant to Article 27M of the Boston Zoning Code. The Mission Hill IPOD imposes interim planning standards for the Mission Hill neighborhood, in contemplation of a rezoning of the neighborhood scheduled to be completed later in 1994.

Pursuant to Article 27M, the Project also requires an Interim Planning Permit (Section 27M-21). Interim Planning Permits may be granted by the Board of Appeal only if the Project is in conformity with an approved Institutional Master Plan (Section 27M-13) and the criteria set forth in Section 27M-21.

Therefore, concurrently with approval of the Project, NEBH is seeking approval of its Institutional Master Plan, which details NEBH's goals and objectives for the next five years, as well as its proposed development program for that time period. A draft Institutional Master Plan was submitted to the BRA for its review on January 14, 1994. It was subsequently submitted to the Mission Hill PZAC and was formally discussed at the PZAC's March 1, 1994 public hearing. A revised Institutional Master Plan was submitted to the BRA and PZAC on March 30, 1994, incorporating comments and suggestions

received from the BRA, PZAC and other parties. PZAC review of the revised Institutional Master Plan occurred at its regularly scheduled meeting on April 5, 1994. BRA approval of the Institutional Master Plan is anticipated to occur concurrently with approval of the Project pursuant to the voluntary Article 31 process.

In addition to the Interim Planning Permit, the Project will require a conditional use permit.

6.2 Regulatory Review and Anticipated Permits

6.2.1 City of Boston Article 31 Development Review

Although the Project does not fall under the BRA's jurisdiction for development review pursuant to Article 31 of the Boston Zoning Code, New England Baptist Hospital has voluntarily agreed to have the Project undergo the Article 31 review process. The Hospital submitted a Project Notification Form (PNF) for the Ambulatory Care Building and Parking Structure Project to the BRA on December 10, 1993.

The BRA issued a Scoping Determination for the Project on January 20, 1994 requiring the preparation of a Draft Project Impact Report (DPIR). A copy of that document is included in Appendix A.

6.2.2 City of Boston Article 27M-13 Review

In accordance with Article 27M-13 of the Boston Zoning Code, NEBH submitted a draft Institutional Master Plan to the BRA on January 14, 1994. The Plan was submitted to the Mission Hill PZAC in accordance with Article 27M-13. As noted, the PZAC held a public hearing on the Master Plan on March 1, 1994, and the IMP was again reviewed by the PZAC at their April 5, 1994 meeting. A follow up community meeting on the IMP, chaired by PZAC, has been scheduled for April 26, 1994.

6.2.3 Anticipated Permits

Federal, State and local permits or other actions which have been or may be sought are listed below. Applications for each permit will be filed unless further study shows that a particular permit is not required. Likewise, if further study reveals that additional permits are needed, appropriate filings will be prepared, as necessary:

Agency Name	Permit or Action
FEDERAL	None anticipated at this time
STATE	
Department of Environmental Protection	
- Division of Air Quality Control	• Pre-Construction Notice
- Division of Water Supply	• Cross Connection Permit
Massachusetts Water Resources Authority	• Sewer Connection/Extension Permit • Sewer Use Discharge Permit
LOCAL	
Boston Redevelopment Authority	• Voluntary Article 31 Development Review - Final Adequacy Determination • Institutional Master Plan Approval (27M-13)
Board of Appeal	• IPOD Permit (27M-21) • Conditional Use Permit
Boston Water and Sewer Commission	• Water and Sewer Tie-In Approval • Discharge Permit for Dewatering
Boston Inspectional Services Department	• Earth Removal Permit • Building Permit
Boston Parks Commission	• Approval for construction of parking structure within 100 feet of a City park (Ord. 7-4.11) • Approval of NEBH Fourth Tier improvements.
Boston Department of Public Works/ Public Improvements Commission	• New Access Permit from Public Way
Committee on Licenses/ Public Safety Commission	• Garage Permit • Fuel Storage License (for parked cars)

7.0 COMMUNITY REVIEW

In addition to voluntary review pursuant to the Article 31 process, the Project is undergoing local community review as part of the approval process for the NEBH's Institutional Master Plan.

7.1 Interested Parties

Community groups, abutters and individuals which may have interest in the Project are listed below:

Name	Relationship to Project
Mission Hill Planning and Zoning Advisory Committee (PZAC)	Community Advisory Group
Boston Natural Areas Fund	Private Organization; Owner of land adjacent to site
Friends of McLaughlin Playground	Community Group
Mission Hill Little League and other users of McLaughlin Playground	Users of Playground
Mr. Ross Donald 141 Fisher Avenue Boston, MA 02120	Abutter/Interested Party
Ms. Hedda Christiani 129 Fisher Avenue Boston, MA 02120	Abutter/Interested Party
Ms. Chris Curtiss 143 Fisher Avenue Boston, MA 02120	Abutter/Interested Party
Mrs. Helen Locke 149 Fisher Avenue Boston, MA 02120	Abutter/Interested Party
Mr. & Mrs. William E. Browning 79 Iroquois Street Boston, MA 02120	Abutter/Interested Party
Ms. Cecilia Houle 73 Iroquois Street Boston, MA 02120	Abutter/Interested Party
Ms. Nancy St. Clair 47 Iroquois Street Boston, MA 02120	Abutter/Interested Party
Mr. & Mrs. Michael Handy 77 Iroquois Street Boston, MA 02120	Abutter/Interested Party

Name	Relationship to Project
Ms. June Howe 130 Fisher Avenue Boston, MA 02120	Abutter/Interested Party
Ms. Susan St. Clair 43 Iroquois Street Boston, MA 02120	Abutter/Interested Party
Mr. Mitchell Hilton 59 Iroquois Street Boston, MA 02120	Abutter/Interested Party
Mr. Joseph & Ms. Margaret Stack 63 Wait Street Boston, MA 02120	Interested Party
Mr. Dennis Pultinas 81 Lawn Street Boston, MA 02120	Interested Party

7.2 List of Meetings

NEBH Meeting with	Date .	Purpose of Meeting
Boston Redevelopment Authority	December 2, 1993	Site visit to Hospital and discussion of Project
	December 8, 1993	Institutional Master Plan Review
	December 20, 1993	PNF Scoping Review For Draft Project Impact Report Submission
	January 6, 1994	Review of BRA Open Space planning effort in Mission Hill
	March 11, 1994	Design Review of Project
	February 15, 1994; March 9, 1994; March 22, 1994	Project and Institutional Master Plan Review
Mission Hill PZAC	January 4, 1994	Scoping of Institutional Master Plan
	March 1, 1994: April 5, 1994	Review of Draft Institutional Master Plan and Proposed Project
Hospital Employees (including residents of Mission Hill)	Jan. 27, 29; Feb. 1, 2, 3, 1994	Review Institutional Master Plan and Ambulatory Care Building and Parking Structure Project

NEBH Meeting with	Date	Purpose of Meeting
City Councilor Thomas Keane	January 28, 1994	Project and Institutional Master Plan briefing: Community Benefits
Boston Transportation Department	January 11, 1994; February 17, 1994; March 2, 1994	Review Transportation Access Plan and Institutional Master Plan transportation scopes requirements
Boston Parks and Recreation Department	March 1, 1994	Design Review
Boston Parks Commission	March 28, 1994	Review Project and Proposed Landscaping of Fourth Tier of McLaughlin Playground
Boston Civic Design Commission	April 5, 1994; April 12, 1994	Review of Project's Design
Other Community residents and abutters	November 1993 through April 1994	Project Review
BRA/Parks and Recreation Department/ Boston Natural Areas Fund	Anticipated in April 1994	Design Review

II. PROJECT DESCRIPTION AND ALTERNATIVES

1.0 DESCRIPTION OF THE SITE

The Project site will be located on NEBH's 19-acre campus at the top of Parker Hill in the Mission Hill section of Boston. The topography of the campus is steep, with ground elevations ranging from approximately 170 feet at the intersection of Parker Hill Avenue and Fisher Avenue, to 225 feet just east of the Project's proposed Parking Structure within the open green area ("meadow") portion of the site. The Project will be located on approximately 4.7 acres (205,000 square feet) of land area, which currently includes undeveloped land and a portion of the Hospital's Parking Lot G. The site also includes a 99,004 square foot (2.25 acres) portion of the City's McLaughlin Playground (referred to as "the Fourth Tier"), which is currently undeveloped and sparsely planted. The Project site is shown in Figure II.1-1.

2.0 SURROUNDING LAND USES

The land uses surrounding the site include either Hospital property, residences or open land. North and northwest of the Project, across Parker Hill Avenue, is NEBH's Parking Lot F. The land east of the site is undeveloped, consisting of additional Hospital property and City parkland, a portion of which was previously used by NEBH for parking but which has been returned to open space uses by NEBH. Further east is McLaughlin Playground, a City-owned park which includes a playground and ballfields maintained by NEBH. South of the site is open space, a portion of which is part of McLaughlin Playground and a smaller portion of which is owned by the Boston Natural Areas Fund, a private not-for-profit organization dedicated to the preservation of open space in the city. Further south of the site along Fisher Avenue are residential uses. The main portion of NEBH's campus is located west of the site.

3.0 PROPOSED PROJECT

3.1 Introduction/Overview

The New England Baptist Hospital is a not-for-profit, non-sectarian, acute care, tertiary referral hospital. It is licensed by the Massachusetts Department of Public Health to operate 205 beds, including 175 medical/surgical beds, 10 intensive care beds, and 20 hospital-based rehabilitation and skilled nursing beds. As a tertiary referral facility, which draws its patients from throughout New England, it is renowned for its treatment of complex conditions, especially orthopedics.

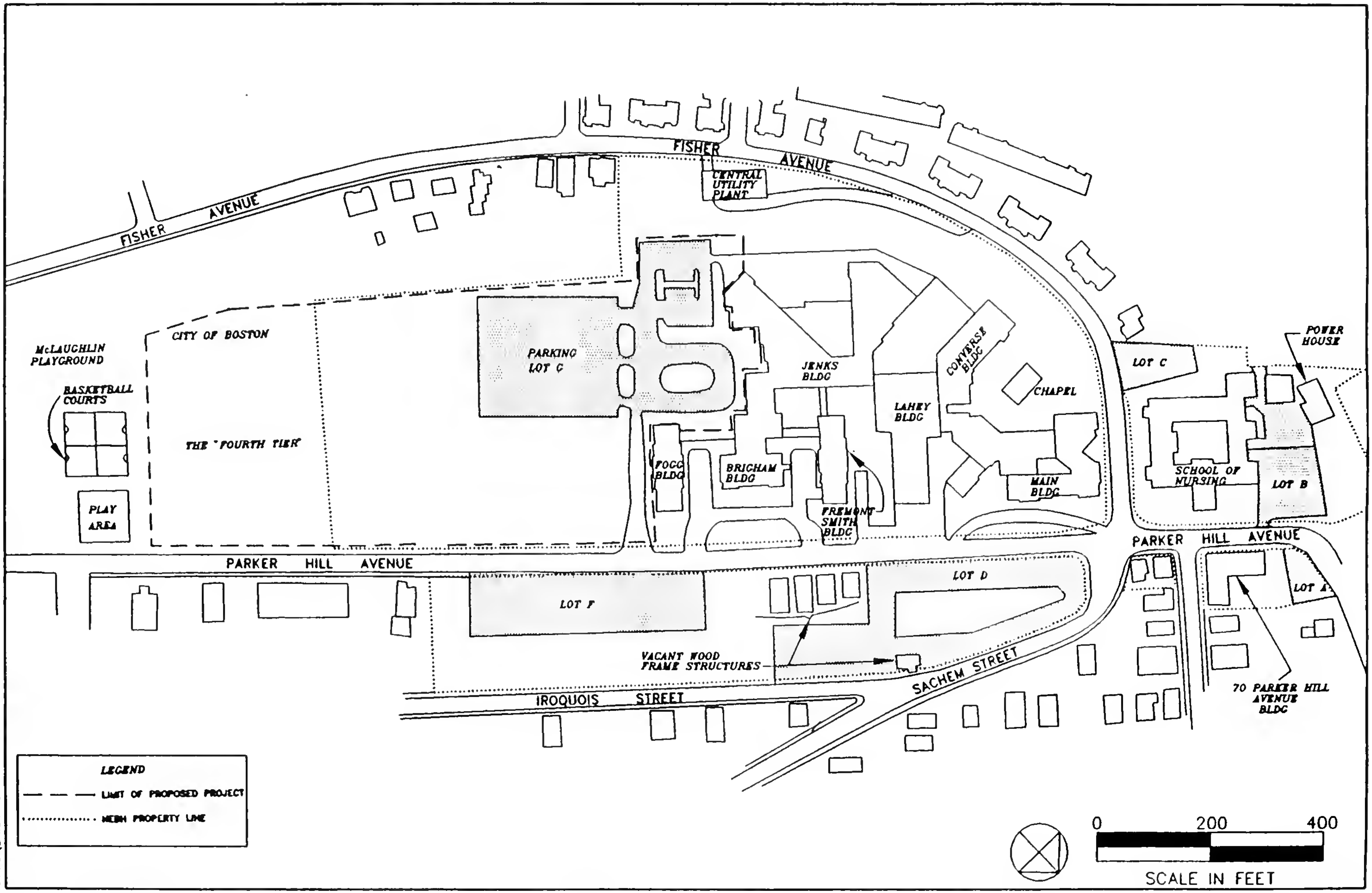

FIGURE II.1-1
PROJECT SITE AND SURROUNDING AREA
NEW ENGLAND BAPTIST HOSPITAL

The New England Baptist Hospital Master Plan has identified program needs in a number of areas, including new medical offices, additional ambulatory care facilities, and additional parking. Over the past several years, NEBH has experienced considerable demand by physicians for quality medical offices on NEBH campus. NEBH anticipates the need for space to accommodate up to approximately 40 additional physicians over the next few years.

As is the case throughout the health care industry, the demand for ambulatory care at NEBH has grown more rapidly than the demand for inpatient care. Therefore, NEBH has a need to develop clinical service areas dedicated to the ambulatory patient, and new medical offices which serve these patients. In order to meet these needs, NEBH proposes to construct a new Ambulatory Care Building, Parking Structure, and Landscape Improvements (the "Project"). Figure II.3-1 shows a site plan for the proposed Project.

3.2 Project Program

The new Ambulatory Care Building will be located in the undeveloped area to the east of the existing Fogg Building. This site is adjacent to NEBH and can be directly linked with the main Hospital buildings.

The Ambulatory Care Building will include approximately 72,000 gross square feet (gsf) of clinical, accessory medical office and support space on three levels plus one partially exposed basement level. The height of the building will be approximately 51 feet above grade on the south facade and 60 feet on the north facade.

The trend toward ambulatory care services also results in increased demand for convenient parking. NEBH will address new parking demands by constructing the proposed Parking Structure, while continuing to have a multi-faceted parking management strategy and supporting use of public transportation by employees and visitors. The new Parking Structure will be 1½ levels at grade or below-grade for self-parking and 3 levels above-grade for valet parking, and will provide parking for approximately 422 cars. The new 422 space Parking Structure will replace 145 existing spaces in Lot G, resulting in a net gain of 277 spaces to the on-campus parking supply. By placing approximately 54% of the parking spaces at grade or below ground level, the visual impact of the Parking Structure will be dramatically reduced. The Parking Structure's total height above-grade will range from approximately 23 to 35 feet. Direct pedestrian access from the Parking Structure to the Ambulatory Care Building will be provided by tunnel under the entry drive. Table II.3-1 summarizes the proposed program for the Ambulatory Care Building and Parking Structure.

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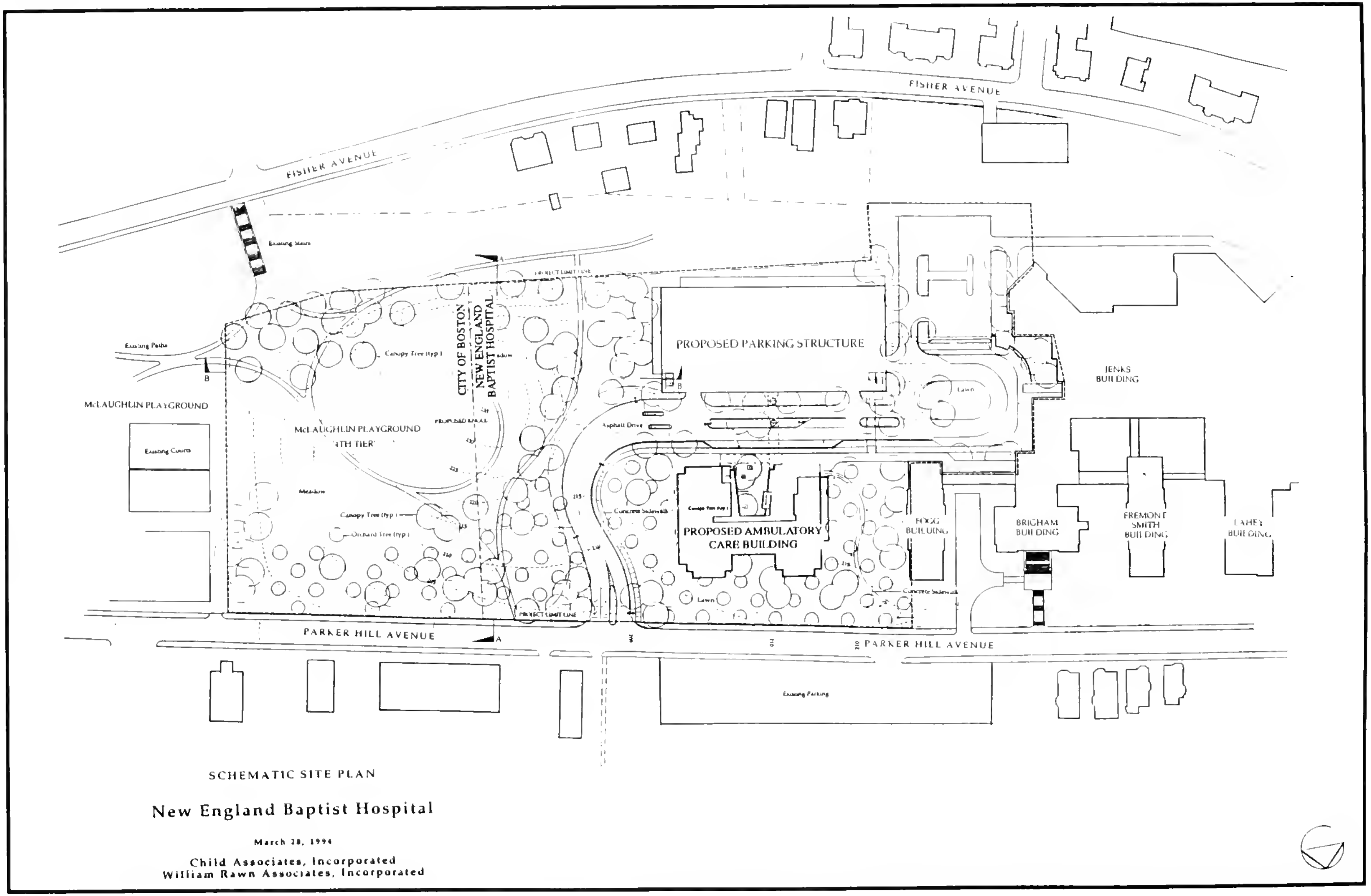

FIGURE II.3-1
PROPOSED SITE PLAN

Table II.3-1: Proposed Program Summary
New England Baptist Hospital Ambulatory Care Building and Parking Structure

Ambulatory Care Building

Floor Level	Proposed Uses	Floor Area (gsf)
B*	Hospital Support/Mechanical Space	18,000
1	Outpatient Clinic, Lobby	18,000
2	Accessory Medical Offices and support uses	18,000
3	Accessory Medical Offices and support uses	18,000
	TOTAL	72,000 gsf

Parking Structure

Level LL2	49 Cars
Level LL1	97 Cars
Level G	82 Cars
Level 2	97 Cars
Level 3	97 Cars
TOTAL	422 Cars

* Basement is half-level, partially exposed on north facade.

Floor plans for the Ambulatory Care Building are shown in Figures II.3-2 through II.3-4.

3.3 Access and Circulation

As a part of the Project, a new entry drive to NEBH from Parker Hill Avenue will be established east of the proposed Ambulatory Care Building. This drive will curve around the building, where vehicles can then access the new Parking Structure or continue to the drop-off area at the existing main Hospital entrance. The current entrance drive will be replaced by a walkway from Parker Hill Avenue and landscaped. These changes will improve circulation within NEBH's campus and establish a safer main access from Parker Hill Avenue, by providing for improved sight distances for vehicles leaving the NEBH campus.

An important element of the Project is an underground connection between the proposed Parking Structure and the Ambulatory Care Building which will enable patients and visitors to move safely and conveniently from the Parking Structure to the Ambulatory Care Building. In addition, the existing at-grade passageway between the Brigham Building and the Fogg Building will be expanded and extended to the new Ambulatory Care Building. This physical link will help provide a unified circulation system between all NEBH buildings, including the Parking Structure. The circulation plan is shown in Figure II.3-5.

3.4 Landscape Improvements

3.4.1 The Meadow and Fourth Tier

An important element of the Project is the creation of extensive landscape improvements in the area to the east of the proposed Parking Structure, encompassing not only a major portion of the meadow on the Hospital's campus which includes a remnant summit of a historic drumlin, but also a portion (the Fourth Tier) of the adjacent McLaughlin Playground. The central idea of the proposed landscape improvements is to recall the historic character of "The Great Hill" through creation of a large, passive recreation area of more than five acres in size that includes extensive plantings of shade trees, pedestrian walkways, and benches. This new area would improve views to the north, west and south of the Hospital and provide dramatic and panoramic views to its users.

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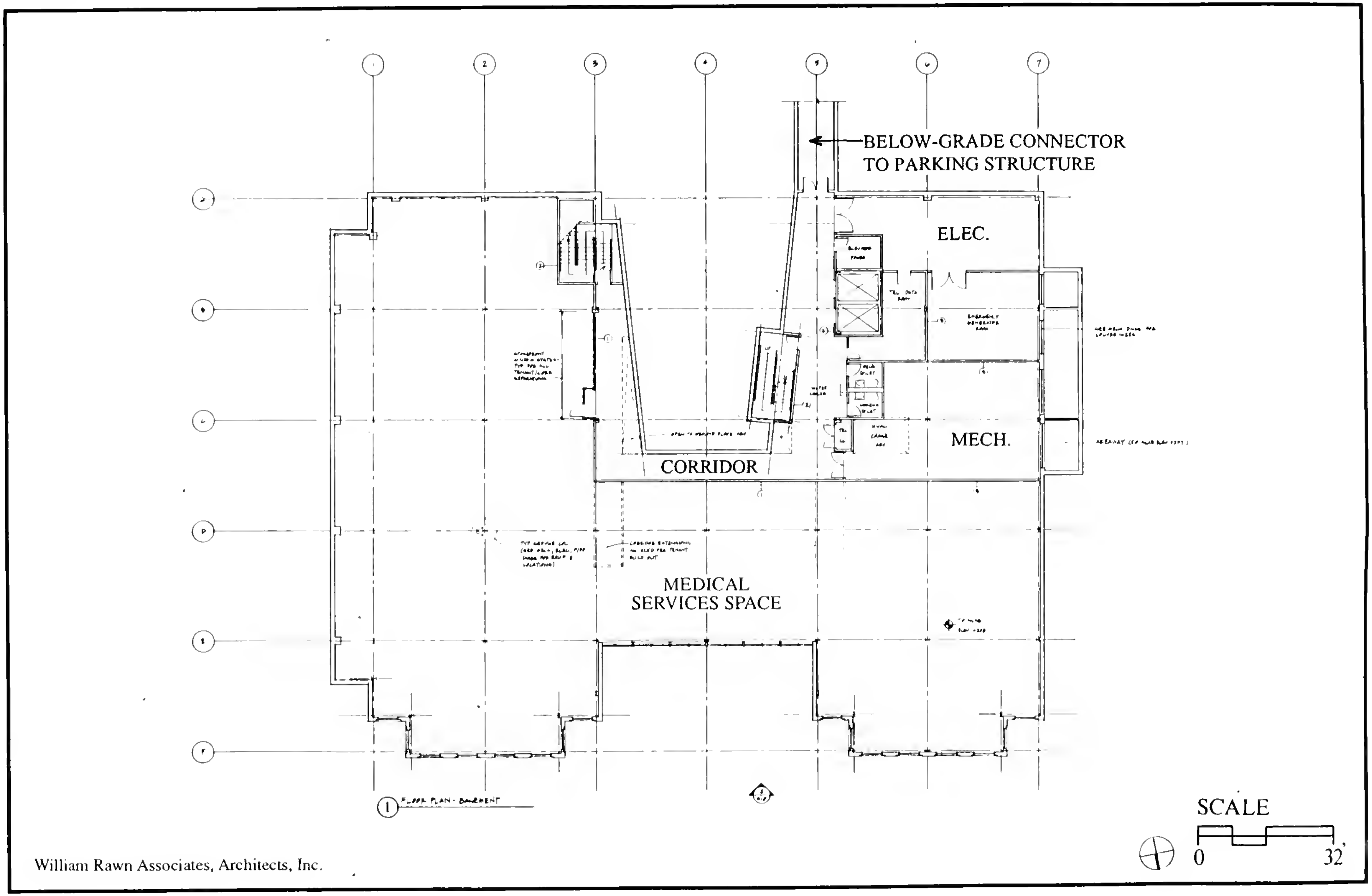

FIGURE II.3-2
AMBULATORY CARE BUILDING
BASEMENT FLOOR PLAN

HMM Associates, Inc.
A Summit Company

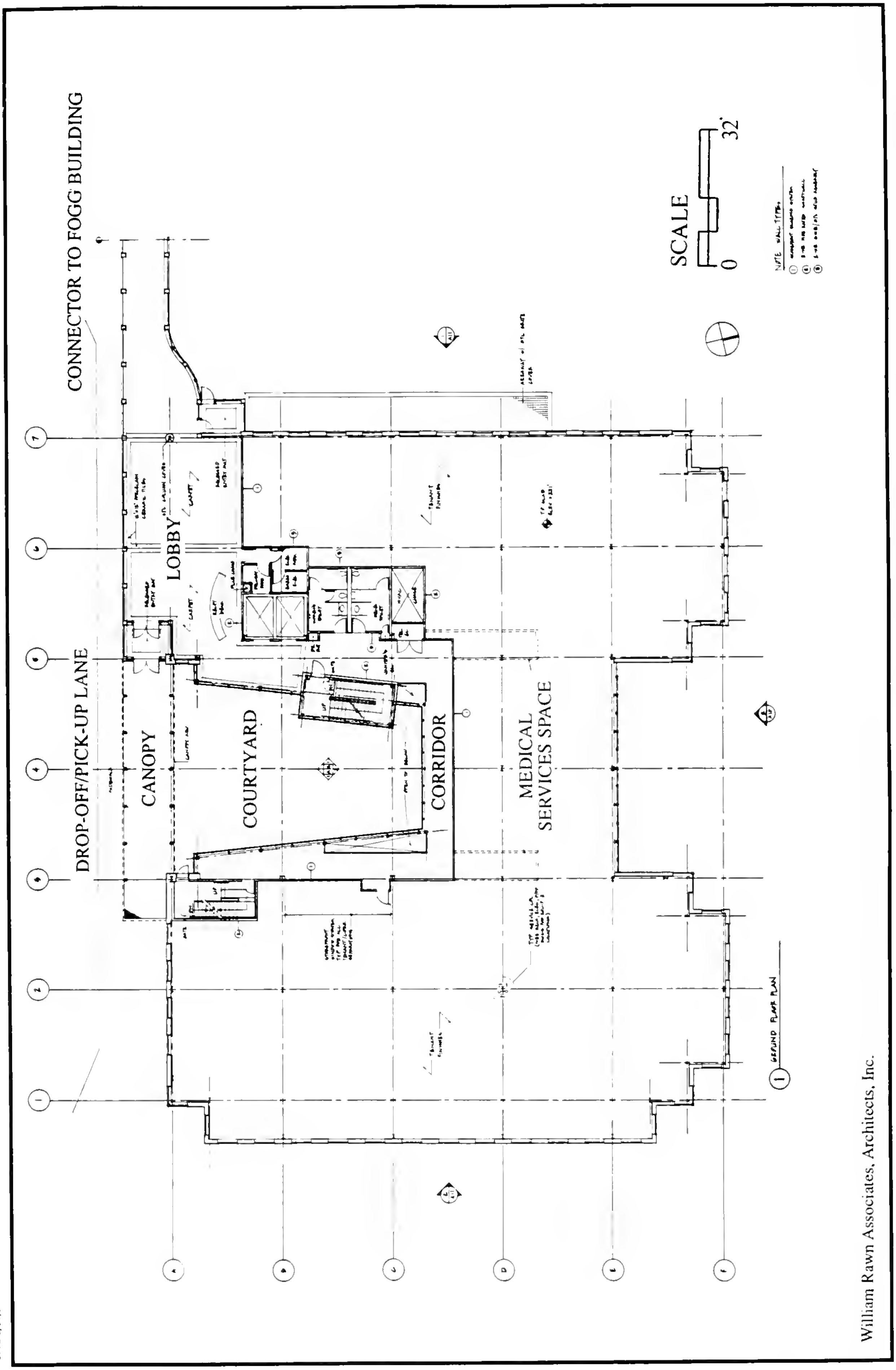

FIGURE II.3-3
AMBULATORY CARE BUILDING
GROUND FLOOR PLAN

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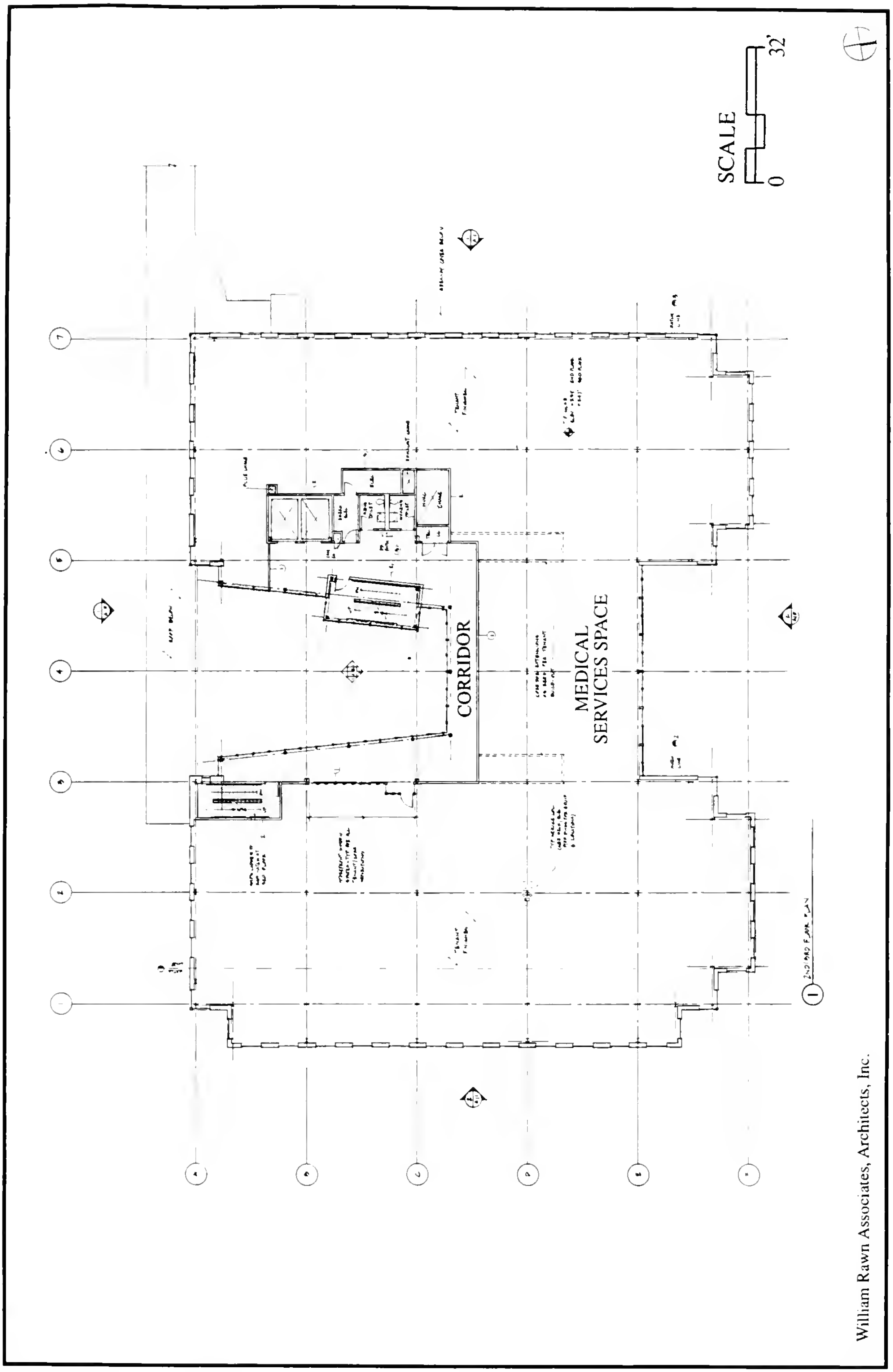

FIGURE II.3-4
AMBULATORY CARE BUILDING
2ND & 3RD FLOOR PLAN

HMM Associates, Inc.
A Summit Company

6778 3/1/94

6778 3/28/94

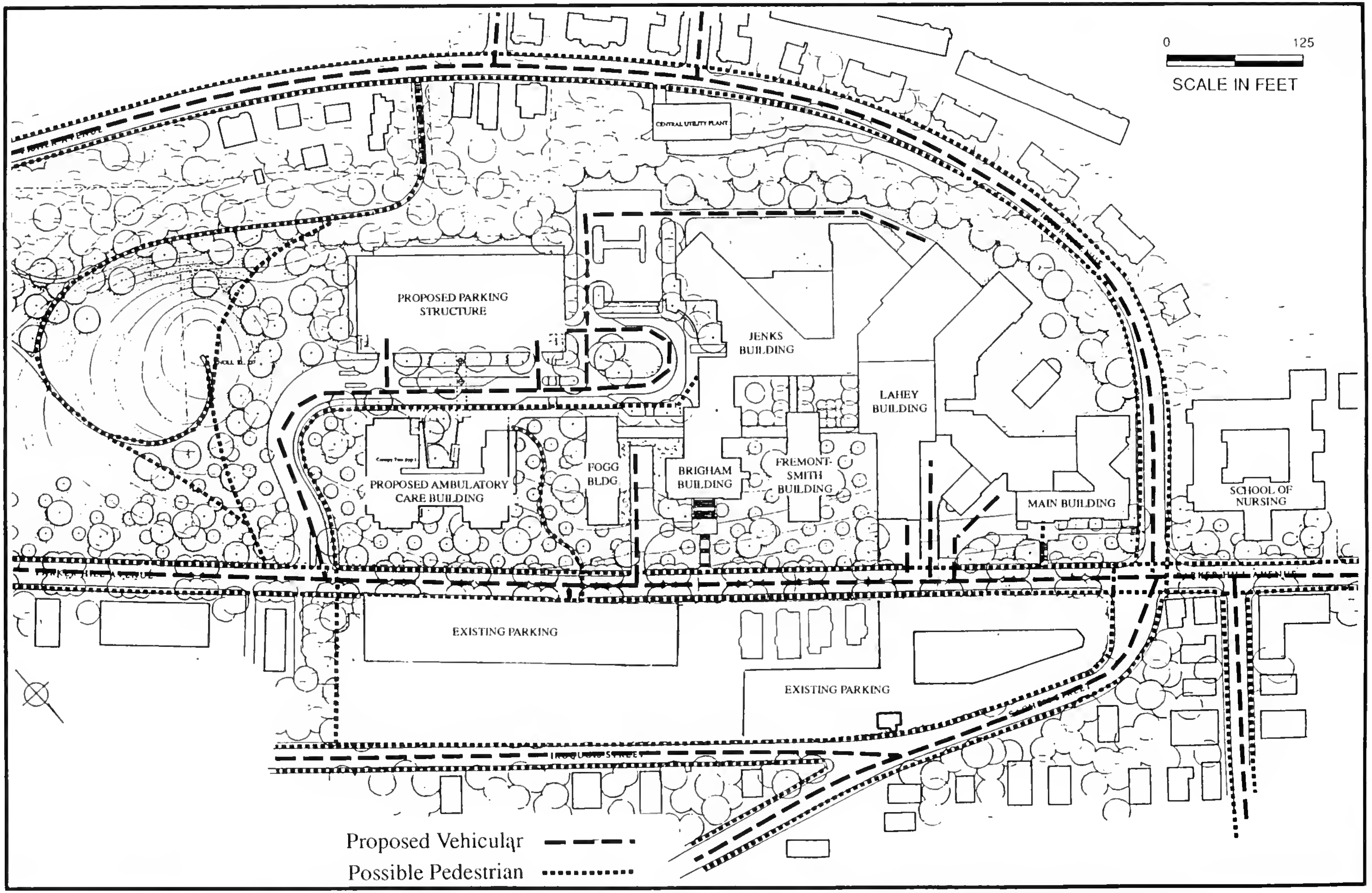

FIGURE II.3-5
PROJECT ACCESS AND CIRCULATION

Creation of this large passive recreation area would not only address an unmet neighborhood need previously identified by the City's Parks and Recreation Department, but also provide an opportunity to re-create connections to urban pathways that have become overgrown from lack of maintenance. Urban pathways that could be re-created include:

1. A walkway which creates a direct link from the Fisher Avenue stairs directly south of the proposed Parking Structure location to the sidewalk adjacent to the new entry drive to the Hospital, thereby facilitating access through the Hospital's campus from Fisher Avenue to Parker Hill Avenue;

2. A walkway from Parker Hill Avenue to the new grand oval walkway to be created in the Fourth Tier; and

3. Re-establishment of the former Oswald Street, directly east of the Hospital's Parking Lot F, to serve as a pedestrian connection between Parker Hill Avenue and Iroquois Street.

Implementation of the Fourth Tier improvements in conjunction with the Hospital's adjacent meadow, and creation of the urban walkways would be contingent upon concurrence of the City's Parks and Recreation Department and the community, and would be funded by the Hospital at an estimated cost of over $100,000. In addition, the Hospital proposes to put in place a conservation easement on the meadow area within its campus, in order to ensure its continued availability as a passive recreation area. NEBH has also proposed to execute a Cooperation Agreement with the City under which it would commit to continuing its annual maintenance of McLaughlin Playground for ten years, and to assume responsibility for annual maintenance of the improved Fourth Tier as well. The estimated value of these in-kind contributions would be at least of $500,000 over the ten year period.

3.5 Other Master Plan Improvements

The Hospital proposes to undertake two additional improvement projects (identified in its Institutional Master Plan and referenced below) following construction completion of the Ambulatory Care Building and Parking Structure Project. Although not part of the Project or within the Project limits, their completion relates to the Hospital's current proposal and will follow the completion of the Ambulatory Care Building and Parking Structure Project by approximately one year.

Parker Hill Avenue Streetscape Improvements

In order to create a more attractive, integrated and clear approach and entry to the Hospital's campus, a Parker Hill Avenue streetscape project is planned, encompassing four elements:

1. The planting of shade trees, spaced so as to provide generous views to the city, the sea, the hills and the mountains;

2. The elimination of the secondary entrance drive and the reversion of that area to planned open space;

3. The removal of collapsing retaining walls along Parker Hill Avenue and the installation of additional plantings and orchard cover in their stead; and

4. Street lighting improvements.

The significant new tree plantings will help to mark and clarify the new vehicular entrance to the Hospital to be constructed as part of the Ambulatory Care Building/Parking Structure Project, and provide graciousness, continuity and beauty to the pedestrian experience on Parker Hill Avenue.

Implementation of these streetscape improvements is planned for 1996.

Parking Lots D and F

The Hospital plans to substantially improve the visual appearance of Lots D and F, as well as their operational efficiency, through an extensive reconstruction program that would have five elements:

1. Removal of the existing vacant residential structures;

2. Regrading of the area to create one consolidated lot that has an improved circulation plan with only one driveway onto Parker Hill Avenue;

3. Creation of a landscaped strip along Iroquois Street, in order to create a natural buffer zone between the parking lot and nearby residential uses;

4. Extensive landscaping along the remaining perimeter of the parking lot to further shield it visually; and

5. Street tree plantings adjacent to the lot on Sachem Street.

The existing steeply sloped wooded area directly north of Lot F would be retained in its existing form as undeveloped open space that further buffers the parking uses from adjacent residential uses. Because of the significant increase in landscaped area that is proposed there will be a decrease in the total number of parking spaces available following these improvements.

In conjunction with the planned improvements to Lots D and F, the Hospital has been involved in discussions with City officials and community leaders about possible improvements that may be needed at the Sachem Street/Parker Hill Avenue intersection in order to improve driver sight lines and ease of vehicular movements there. These changes include parking restrictions and a change in the intersection's geometry. The planned improvements to Parking Lots D and F will be designed to accommodate any alterations to this intersection that may be identified as essential to improved traffic circulation or traffic safety.

Since Lots D and F will need to be used for visitor parking during the construction period for the Ambulatory Care Building and Parking Structure Project, the planned improvements project will take place subsequently, in 1996.

III. TRANSPORTATION COMPONENT AND TRANSPORTATION ACCESS PLAN

III. TRANSPORTATION COMPONENT AND TRANSPORTATION ACCESS PLAN

The BRA's scoping determination for the Project Impact Report directed NEBH to evaluate the transportation impacts associated with the Project. In addition, Section 27M-15 of the Boston Zoning Code (part of the Mission Hill IPOD) requires preparation of a Transportation Access Plan for the Project, since it involves an institutional use. This section of the DPIR will serve as the Transportation Access Plan.

Pursuant to the BRA's scoping determination, (technically completed by the Boston's Transportation Department (BTD), the following issues are addressed in this DPIR:

- A definition of existing traffic, transit, and parking conditions;
- An evaluation of the Project's long-term effects on traffic, transit, and pedestrian activities as well as on parking demand;
- Identification of appropriate mitigation measures, including long-term project impact monitoring;
- An evaluation of the Project's short-term traffic impacts related to construction activity.

As part of this scoping determination, the BTD required the analysis of the following five intersections (See Figure III.1-1):

- Tremont Street/Parker Street
- Huntington Avenue/Parker Hill Avenue
- Huntington Avenue/South Huntington Avenue
- South Huntington Avenue/Heath Street
- Parker Street/Heath Street (Heath Square)

1.0 EXISTING CONDITIONS

1.1 Study Area and Major Roadway Characteristics

The New England Baptist Hospital (NEBH) is located along Parker Hill Avenue, at the top of Parker Hill, in the Mission Hill neighborhood of Boston, Massachusetts. The existing roadways within the study area consist of numerous local streets, i.e., Parker Hill Avenue, Fisher Avenue, Iroquois Street and Sachem Street. The roadways in the area serve a mix of residential and commercial land uses.

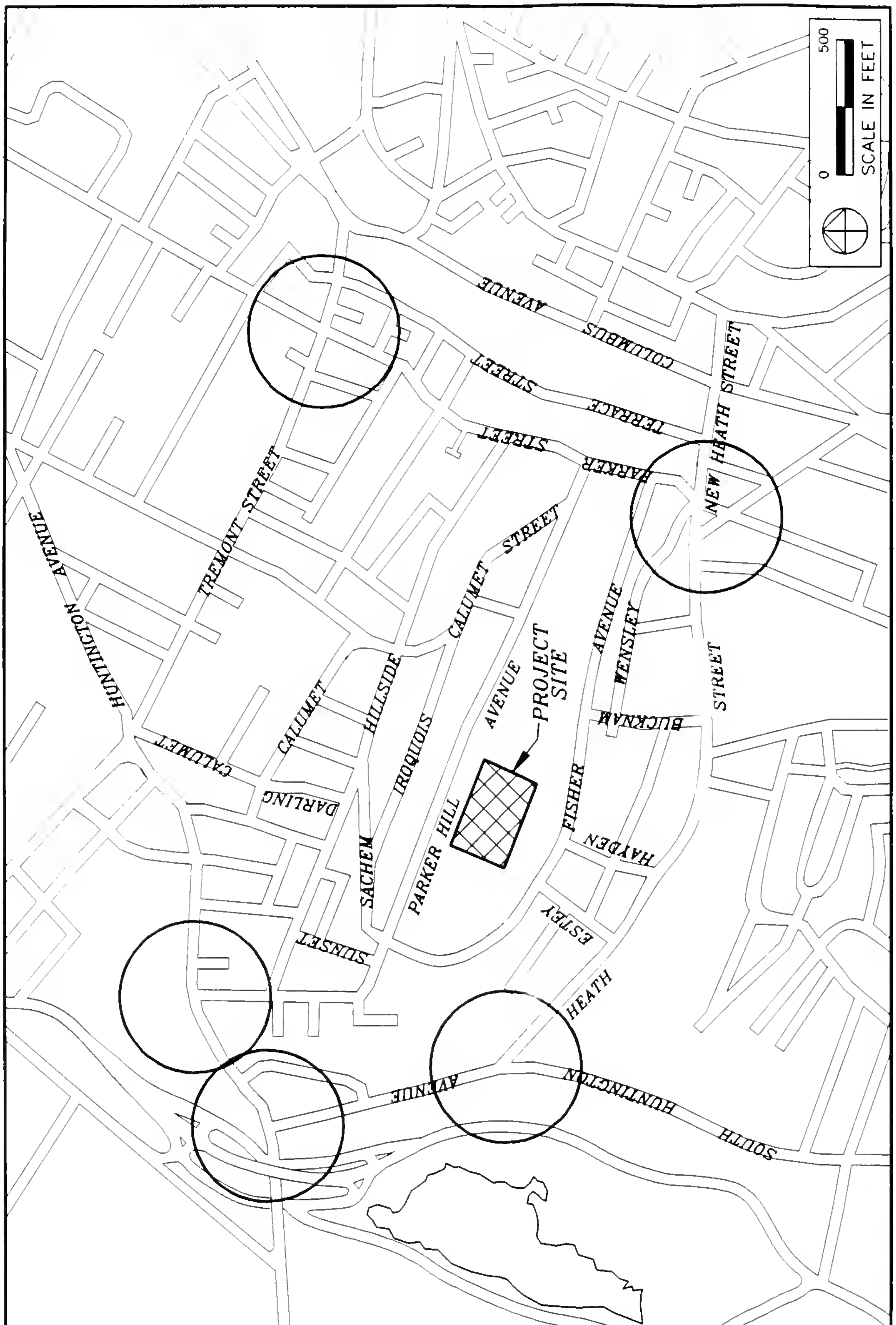

FIGURE III.1-1
TRAFFIC STUDY AREA
NEW ENGLAND BAPTIST HOSPITAL

HMM Associates, Inc.

Parker Hill Avenue is the major roadway which serves the site; it runs in a north-south direction from Huntington Avenue to the west of New England Baptist Hospital, and then turns 90 degrees and runs in an east-west direction to Parker Street. In the vicinity of the Hospital, Parker Hill Avenue operates as a 26-foot wide, two-lane, bi-directional roadway. Its horizontal alignment along Parker Hill Avenue is relatively straight with the exception of a sharp horizontal curve located to the west of the Hospital. The vertical alignment consists of a steep upgrade from Huntington Avenue to Fisher Avenue, which begins to level off in the vicinity of the Hospital. Parking is partially allowed on the north side of the street only in the vicinity of the Hospital. The intersection of Parker Hill Avenue and Huntington Avenue is controlled by a traffic signal, while the Parker Hill Avenue/Fisher Avenue intersection is controlled by a stop sign on Fisher Avenue. There are no speed limit signs posted in the vicinity of the Hospital.

Fisher Avenue is a local roadway which serves the Hospital and the surrounding area just west of the Hospital, extending from Parker Street to Parker Hill Avenue. In the vicinity of the Hospital, Fisher Avenue operates as a 25-foot roadway accommodating two lanes of traffic with unrestricted parking on the east side of the roadway. Its horizontal alignment consists of a large radius curve south of Parker Hill Avenue, while its vertical alignment is relatively steep ascending Parker Hill. The intersection of Fisher Avenue and Parker Hill Avenue is stop controlled on Fisher Avenue. The land uses along Fisher Avenue are primarily residential and open space. No speed limit signs are posted along Fisher Avenue in the vicinity of the Hospital.

Sachem Street is a local roadway on Parker Hill extending from Calumet Street to Parker Hill Avenue. In the vicinity of the Hospital, Sachem Street operates as a 25-foot wide, one-way street accommodating two lanes of traffic and residential permit parking along the west side of the roadway. Its horizontal alignment can be described as winding; its vertical alignment consists of a moderate upgrade, although not as steep as that noted on Parker Hill Avenue or Fisher Avenue. The intersection of Sachem Street and Parker Hill Avenue is stop controlled on Sachem Street.

1.2 1994 Existing Traffic Volumes

Traffic volume data for the five study area intersections (see Figure III.1-1) was obtained by HMM Associates through manual traffic counts conducted in February and March 1994. These counts included turning movements taken during the 7:00 to 9:00 AM and 4:00 to 6:00 PM weekday peak traffic hours, as well as 24-hour total counts along selected local streets. All traffic data

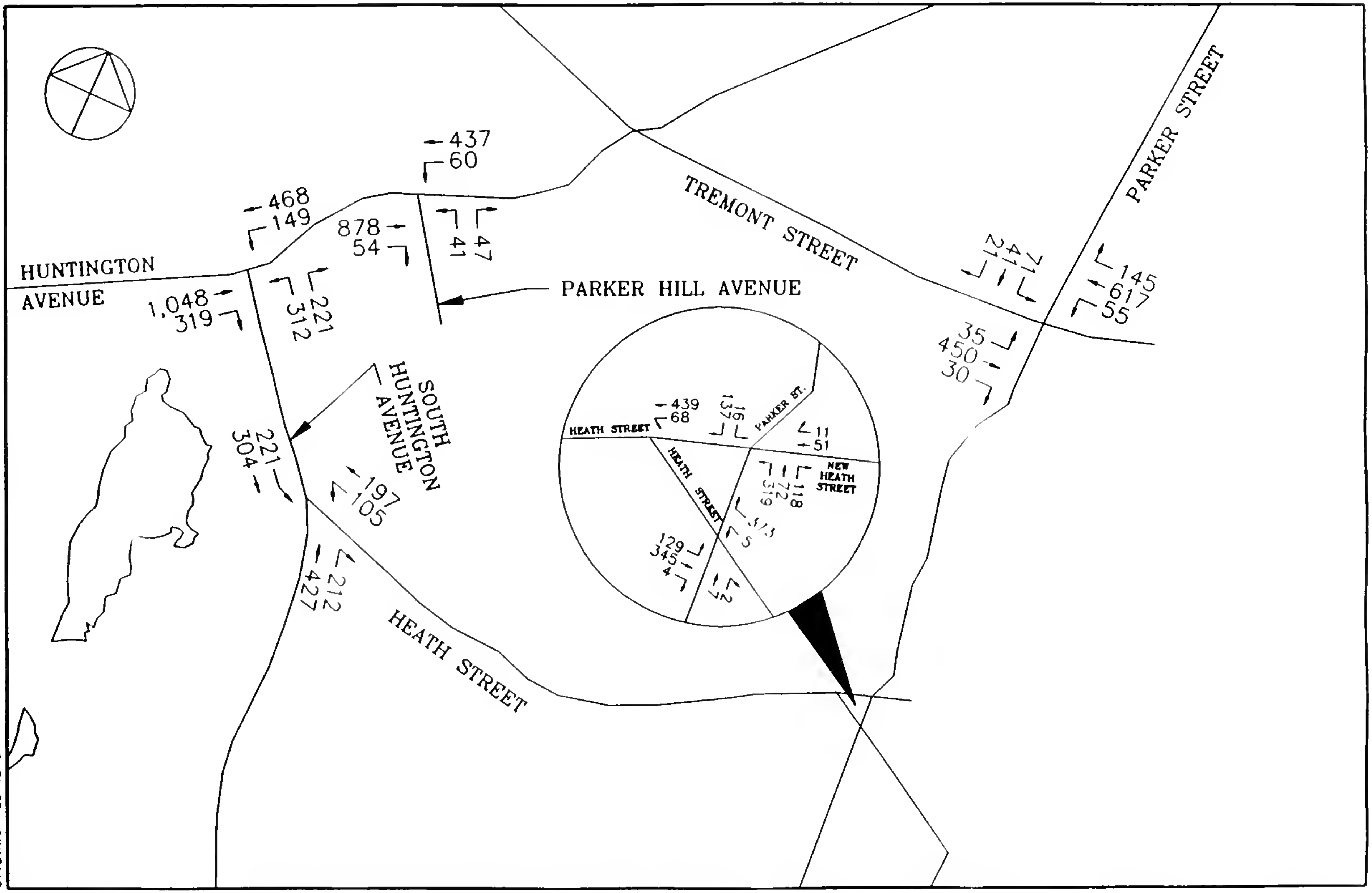

FIGURE III.1–2
1994 EXISTING AM PEAK HOUR TRAFFIC VOLUMES
NEW ENGLAND BAPTIST HOSPITAL

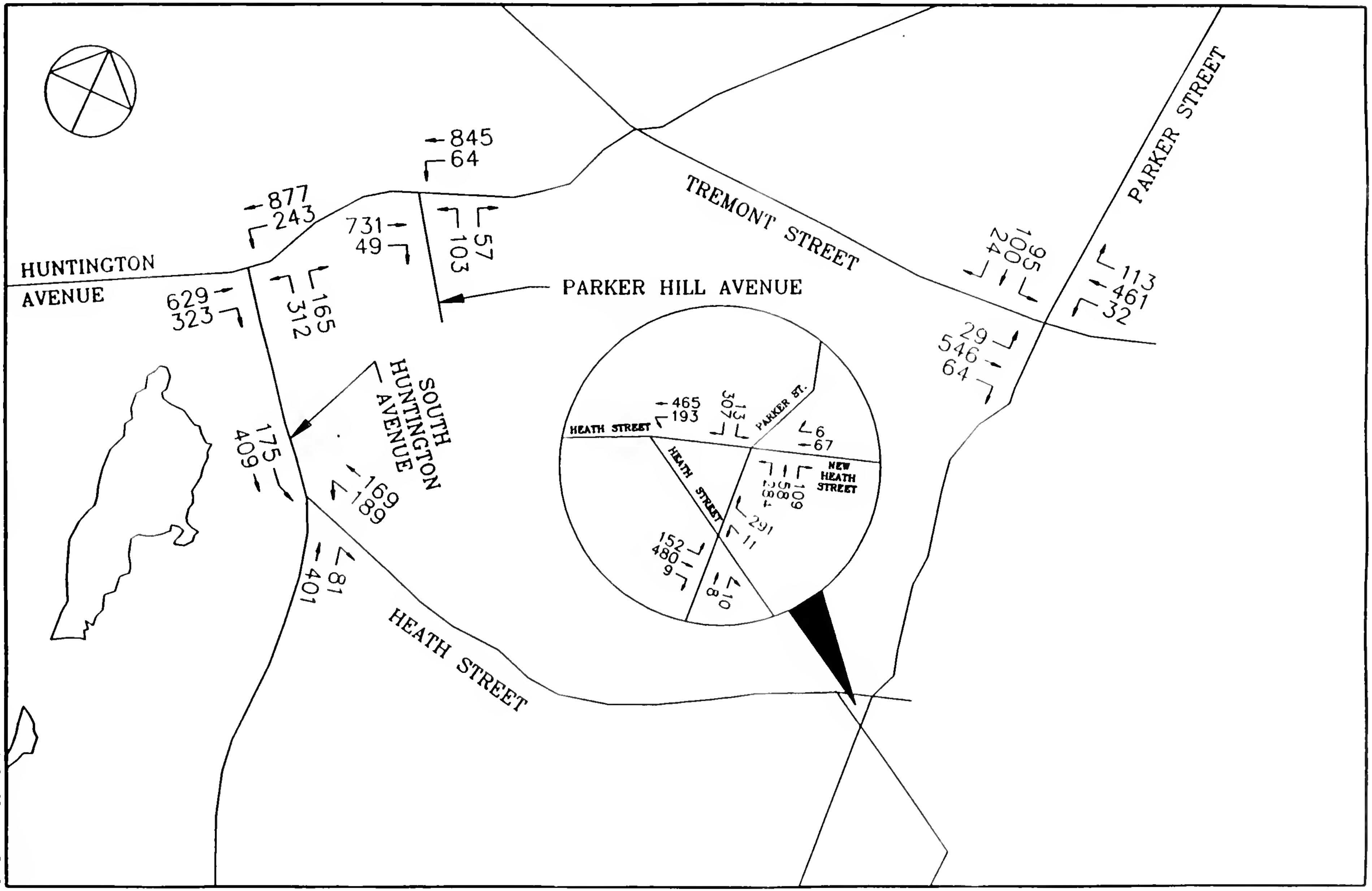

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FIGURE III.1-3
1994 EXISTING PM PEAK HOUR TRAFFIC VOLUMES
NEW ENGLAND BAPTIST HOSPITAL

HMM Associates, Inc.
A Summit Company

collected is shown in Appendix C. Figures III.1-2 and III.1-3 show the 1994 existing AM and PM traffic volumes during the peak hours.

In addition to peak hour counts, 24-hour traffic volumes were collected along Parker Hill Avenue in March 1994. According to the data (Appendix C), Parker Hill Avenue has a daily volume of 3,137 vehicles, with 1,420 traveling eastbound and 1,717 traveling westbound.

1.3 1994 Existing Operating Conditions

Existing traffic operations were analyzed according to standard procedures and practices outlined in the 1985 Highway Capacity Manual. The efficiency of traffic operations at a location (or changes in traffic operations), is measured in terms of Level of Service (LOS). The LOS refers to the quality of traffic flow along roadways and at intersections. It is described in terms of Levels A through F; where A represents the best possible free-flow traffic conditions, and F represents congested, forced-flow or failing conditions. These LOS measures are discussed briefly below, and Table III.1-1 summarizes their interrelationships.

At signalized intersections, LOS is defined in terms of average approach delays (measured in seconds). Average delay measures the mean stopped delay experienced by vehicles entering a signalized intersection during the peak hour period. Average delay is measured for each individual approach and for the intersection as a whole. The LOS deteriorates as average delays increase.

At unsignalized intersections, LOS is defined in terms of reserve capacity. The reserve capacity is the unused capacity of an approach lane(s) to an intersection. This measure, defined as passenger cars per hour, indicates how many more vehicles would be required to bring the intersection approach lane(s) to capacity. The LOS deteriorates as reserve capacity values decrease.

From the 1994 existing conditions analysis, only one of the three signalized intersections studied operate at LOS E or worse during either peak hour period (Table III.1-2). This is the intersection of South Huntington Avenue and Huntington Avenue, which operates at LOS E during the AM peak hour and at LOS D during the PM peak hour. (In a densely populated urban area such as Parker and Mission Hills, LOS D and E conditions are typical, with LOS D conditions considered average.) The two other signalized intersections operate at LOS C or better for both AM and PM peak hours. The majority of movements at the two unsignalized intersections operate at acceptable LOS except for two approaches. One approach is the Heath Street approach to

Table III.1-1 Level of Service (LOS) Designations*

Category	Description	Delay Range** (Seconds/Vehicle)	Reserve*** Capacity (Vehicles/Hour)
LOS A:	Describes a condition of free flow, with low volumes and relatively high speeds. There is little or no reduction in maneuverability due to the presence of other vehicles, and drivers can maintain their desired speeds with little or no delay.	0.00-5.0	400+
LOS B:	Describes a condition of stable flow, with desired operating speeds relatively unaffected, but with a slight deterioration of maneuverability within the traffic stream.	5.1-15.0	300-399
LOS C:	Describes a condition still representing stable flow, but speeds and maneuverability begin to be restricted. The general level of comfort begins to deteriorate noticeably at this level.	15.1-25.0	200-299
LOS D:	Describes a high-density traffic condition approaching unstable flow. Speeds and maneuverability become more seriously restricted, and the driver experiences a poor level of comfort.	25.1-40.0	100-199
LOS E:	Represents conditions at or near the capacity of the facility. Flow is usually unstable, and freedom to maneuver within the traffic stream becomes extremely difficult.	40.1-60.0	0.99
LOS F:	Describes forced flow or breakdown conditions with queuing along critical approaches. Operating conditions are highly unstable as characterized by erratic vehicle movements along each approach.	60.1 or greater	N/A

* Source: Transportation Research Board, *Highway Capacity Manual*, Special Report 209, 1985.

** Delay ranges relate to the mean stopped delay incurred by all vehicles entering the intersection and do not consider the effects of traffic signal coordination. This criteria is intended for use in the evaluation of signalized intersections.

*** Reserve capacity refers to the unused capacity of the minor approach, on a per-lane basis. This criteria is limited to use in the evaluation of unsignalized intersections.

Table III.1-2 1994 Existing Peak Hour Levels of Service (LOS)

Signalized Intersections

Location	AM Peak LOS	AM Peak Delay (Seconds)	PM Peak LOS	PM Peak Delay (Seconds)
• South Huntington Ave./Huntington Ave.	E	41.3	D	26.3
• Huntington Ave./Parker Hill Ave.	B	9.1	B	14.2
• Tremont St./Parker St.	B	10.5	C	21.3

Unsignalized Intersections

Location	AM Peak LOS	AM Peak RC	PM Peak LOS	PM Peak RC
• Heath St./Parker St.				
LT from Heath EB:	A	601	A	699
LT from Heath WB:	A	808	A	698
All moves from Boston Housing Authority Driveway:	B	328	B	381
LT from Parker NB:	A	680	A	765
LT from Parker SB:	A	841	A	891
All moves from New Heath St.:	B	313	B	342
All moves from Heath SW	B	339	F	-107
• South Huntington Ave./Heath St.				
LT from South Huntington SB:	A	485	A	534
All moves from Heath St.:	F	-1	F	-122

RC = Reserve Capacity.

EB = Eastbound

WB = Westbound

SB = Southbound

NB = Northbound

LT = Left turn

South Huntington Avenue, when delays experienced by automobiles waiting to enter South Huntington Avenue traffic lanes from Heath Street result in LOS F conditions during both peak hours. Vehicles at this intersection also have conflicts with MBTA light rail vehicles (LRV). The Heath Street Station is located here. The other area of unacceptable LOS occurs during the PM peak only for vehicles entering Heath Street from New Heath Street. It should be noted that some of these locations are poorly designed. As noted previously, the South Huntington Street/Heath Street intersection has poor channelization and lane markings due to the MBTA station and LRV tracks. The New Heath Street/Heath Street/Parker Street intersection almost operates as a rotary and is three intersections in one.

1.4 Existing NEBH Trip Characteristics

1.4.1 Employee Trip Characteristics

The current NEBH staff level is 1,200 employees. Based upon an employee survey conducted by HMM Associates and the Hospital during the winter, 1994, the largest volume of employees arrive between 8:00 AM and 9:00 AM and depart between 5:00-6:00 PM. The Hospital estimates that approximately 83% of the total staff work during the day-shift (7:00 AM to 5:00 PM).

According to the survey, (Table III.1-3) NEBH employees overall have a high dependence upon the single occupant vehicle (66%), which is expected when the Hospital's geographical location is taken into account. In addition, 9% of the surveyed employees car pool. The survey results found that physicians and nurses tend to use their private cars more often than other employee groups. The use of single occupant vehicles by physicians (65%) and nurses (72%) is consistent with the demanding work schedules of these medical professionals. Physicians often work at multiple office locations during the day and need their automobiles (for example, many NEBH doctors operate from private offices at One Brookline Place). Nurses often arrive before 7:00 AM when MBTA bus service is either not available or scheduling not as frequent, requiring greater automobile use. In addition, many nurses work double-shifts which result in nurses working through the evening shift, presenting both scheduling and safety concerns for use of night-time public transportation. Therefore, for these employee groups, forms of transportation other than driving become difficult.

The survey also indicated that, despite the lack of direct MBTA service to Parker Hill, approximately 11% of all employees, and 14% of Physicians utilize the MBTA. An additional 4% of all employees and 9% of Physicians

Table III.1-3 Existing Modal Share (Person Trips) From Hospital Survey

Mode	% Share				
	Physicians	Nurses	Tech./Prof.	Other	Overall
Drive Alone	69%	72%	64%	68%	66%
Carpool	3%	15%	6%	7%	9%
MBTA	14%	8%	12%	12%	11%
Mission Link	9%	2%	2%	4%	4%
Walk	3%	2%	9%	7%	5%
Other	2%	7%	7%	2%	5%

Source: New England Baptist Hospital, Employee Transportation Survey, February 1994.

use the Mission Link Bus, a "Community Shuttle Bus," which provides direct service to the Hospital from Brigham Circle. Section 1.6 describes transit service in Parker Hill in detail.

1.4.2 Visitor/Patient/Outpatient Trip Characteristics

Based upon data provided by the Hospital (Appendix C), there are approximately 440 patient/outpatient arrivals at the Hospital per weekday. The majority of outpatient visits (85%) occur during off-peak hours. For a typical day, approximately 15% of these visits occur during the morning/evening peak hour periods, or 3.75% during each hour. The resulting peak hour automobile trips are 17 arrivals during the AM peak hour and 17 departures during the PM peak hour.

1.5 Existing Parking Conditions

1.5.1 Off-Site and On-Street Parking

An off-site and on-street parking study was performed to determine the availability of parking for NEBH-related users and local residents. The study was limited to on-street parking within 2 blocks of the campus and included Parker Hill Avenue, Sachem Street, Iroquois Street, Fisher Avenue and Parker Street. Streets regulated by the Mission Hill Resident Parking Program were identified, as were time-regulated and unregulated areas (see Figure III.1-4).

Mission Hill Resident Parking Program

Residents of Mission Hill receive priority parking on the following streets:

- Parker Hill Avenue along northern side between Hospital and Parker Street.
- Fisher Avenue between Lot C and Bucknam Street along the northern side; and between Bucknam Street and Parker Street along the southern side.
- Sachem Street along the northern side between Iroquois Street and Hillside Street.
- Iroquois Street between Sachem Street and Calumet Street.
- Calumet Street between Iroquois Street and Parker Hill Avenue along the southern side.
- Hillside Street between Sachem Street and Parker Street.

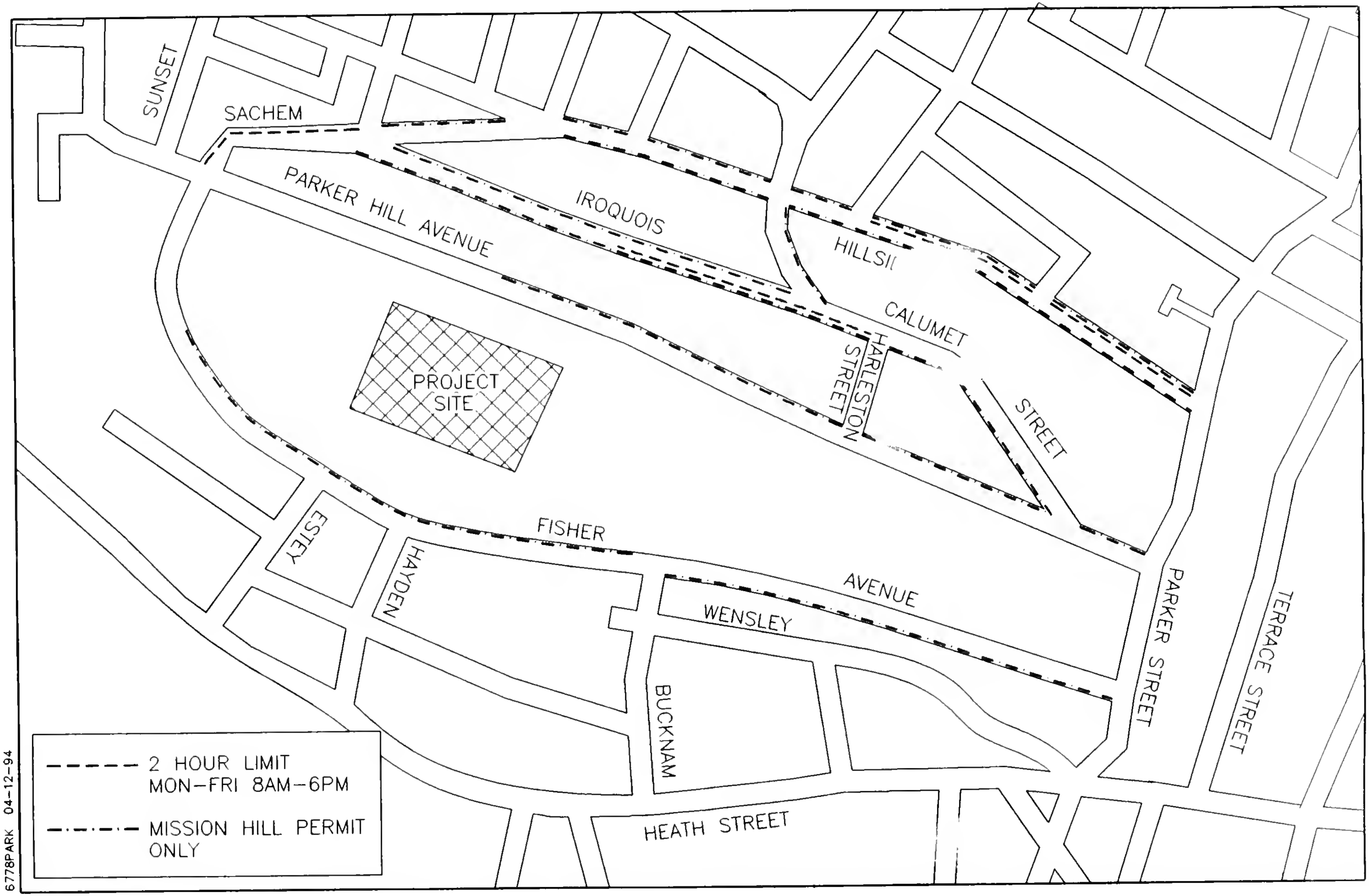

FIGURE III.1–4
ON STREET PARKING IN THE VICINITY OF NEBH CAMPUS
NEW ENGLAND BAPTIST HOSPITAL

1.5.2 New England Baptist Hospital Parking Supply

New England Baptist Hospital maintains a total supply of 595 parking spaces, including 475 spaces on the Mission Hill campus and 120 in a satellite parking lot located at Brookside Avenue in Jamaica Plain. As shown in Table III.1-4 and Figure III.1-5, the majority of these parking spaces are located on the campus at Parking Lots D and G with 136 and 185 spaces available, respectively. Lot D is reserved for employees, and Lot G for patients/outpatients, visitors, physicians, and second shift nurses.

The regular day-shift employee cost for parking ranges from $3.00 per week at the Jamaica Plain satellite parking lot to $12.00 per week on campus. Physicians pay $80.00 per month for on-campus parking privileges. Night shift employees park in Lot G at a weekly cost of $3.00. Patients/outpatients and visitors pay a maximum of $5.00 per day.

The current staff at New England Baptist Hospital includes 1,200 employees, 996 of whom work during the day-shift. Table III.1-5 shows a theoretical parking demand of 705 employee spaces; private physician, patients, and outpatients created a demand for an additional 147 short-term spaces resulting in a total demand of 852.

A parking occupancy study was conducted for all six on-campus parking lots to determine their utilization, with a special emphasis on Lot B and Lot G, which provide visitor/patient/outpatient parking. The utilization study of Lot G was conducted during the afternoon (3:00 PM to 6:00 PM) peak hours on Tuesday, March 9, 1994 and during the morning (6:00 AM to 9:00 AM), and midday (12:00 noon to 2:00 PM) peak hours on Wednesday, March 10, 1994. For Lots A, B, C, D, and F, a parking study was conducted during the morning (6:30 AM to 9:00 AM), midday (11:00 AM to 2:30 PM) and afternoon (3:30 PM to 5:00 PM) peak hours on April 8, 1993.

Table III-1.4 Existing Parking Supply and Assignment

Parking Lot	Users	Parking Spaces
On-Campus		
Lot A	Employees	8
Lot B	Patients, Outpatients, Visitors, Physicians	41
Lot C	Employees	18
Lot D	Employees	136
Lot F	Employees	87
Lot G	Patients, Outpatients, Visitors, Physicians, Second Shift Employees	185
	SUBTOTAL ON-CAMPUS	**475**
Off-Campus: Satellite		
Brookside Avenue (Jamaica Plain)	Employees **SUBTOTAL OFF-CAMPUS**	**120**
	TOTAL SPACES	**595**

120

On Campus 729

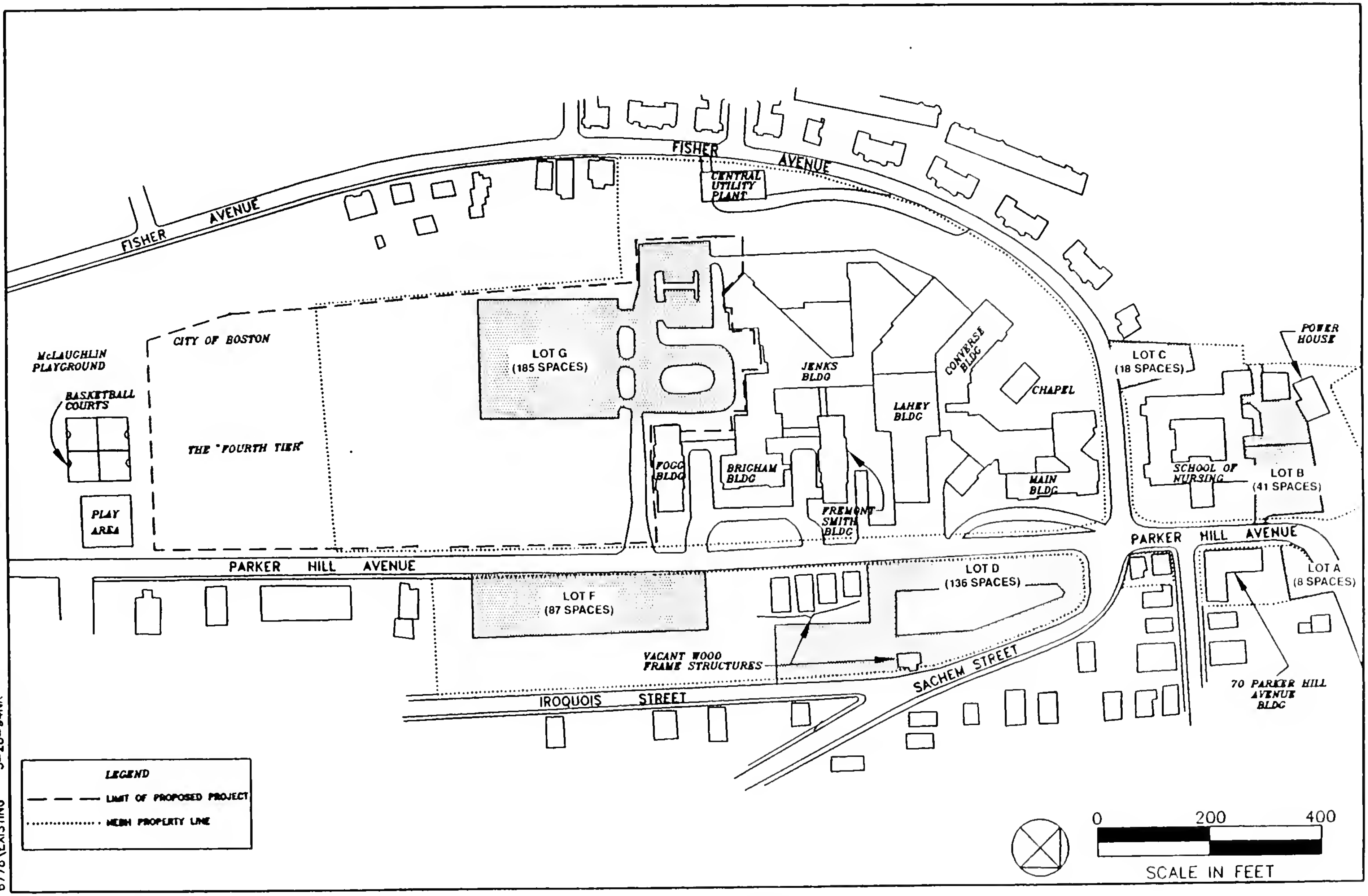

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FIGURE III.1-5
ON CAMPUS PARKING SUPPLY BY PARKING LOT
NEW ENGLAND BAPTIST HOSPITAL

HMM Associates, Inc.
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Table III.1-5 1994 Existing Parking Demand

EMPLOYEES

Year	Total Employees	% Day Shift	Auto Mode Split	Auto Occupancy	Daily Autos (One Way)	Daily Turnover Rate (Utilization)	Employee Parking Space Demand (Long Term)
1994	1,200	83%	75%	1.06	705	1.0	705

VISITORS/PATIENTS/OUTPATIENTS

Year	Daily Patients/ Outpatients	Auto Mode Split	Auto Occupancy	Daily Auto's (One Way)	Daily Turnover Rate (Utilization)	**Visitors/ Patients/ Outpatient Parking Demand (Short Term)**	**Total Parking Space Demand (Employees and Visitors/ Outpatients)**
1994	440	100%	1.0	440	3.0	**147**	**852**

The survey data indicate that 88% of all spaces (162 cars) in Lot G were occupied as early as 9:00 AM. Between noon and 2:00 PM, total capacity was exceeded in Lot G, with occupancy ranging from 110% to 123% (227 cars at 2:00 PM). At Lot B, the average occupancy is 175% (72 cars) on Tuesdays, when most of the clinics are open. The study also shows that between 9:00 AM to 11:00 AM and between 1:00 PM to 2:30 PM, Lot B has the maximum number of outpatient vehicles.

1.6 Transit

1.6.1 MBTA Service

The nearest MBTA transit lines servicing NEBH are the Green Line's E-Branch, which runs along Huntington Avenue and the Orange Line. The E-Branch runs down Huntington Avenue to South Huntington Avenue with a stop at the corner of Huntington Avenue and Parker Hill Avenue, which is about one-half mile from New England Baptist Hospital. E-Branch trains continue along South Huntington Avenue to the Jamaica Plain VA Hospital at Heath Street. The Orange Line has two stations near the Hospital, Jackson Square and Roxbury Crossing. Both are approximately the same distance from the Hospital. However, Roxbury Crossing is served by the Mission Hill Link's Blue Route 1 bus. Both branches operate seven days a week, from 5:30 AM until 12:45 AM. Service is scheduled to run at least every 10 minutes during most of those hours, although service is less frequent during late evening, early morning and weekend hours.

MBTA bus service along Huntington Avenue is provided by Route 39 which runs between Forest Hills Station and Back Bay Station (service every 5 minutes during peak periods). There is no scheduled MBTA service along Parker Hill Avenue, the main roadway serving the Hospital. The nearest Route 39 stop is located at the foot of Parker Hill Avenue.

1.6.2 Mission Link Bus

The Mission Hill Link Bus is operated by a non-profit community based organization, and has served Mission Hill residents and employees since 1987. The schedule for this "community shuttle bus" lists three (3) routes:

- ***Blue Route 1*** - Brigham Circle-Tremont - Roxbury Crossing T Stop-Columbus - Cedar-Terrace-Gore-Parker-Hillside-Calumet-Parker Hill Avenue - Parker St.-Fisher Avenue-Resthaven - Baptist Hospital - Parker Hill Avenue - Hillside - Darling - Pequot - Wait - Huntington - Brigham Circle.

- ***Red Route 2*** - Brigham Circle - Tremont-St. Alphonsus - Ward - Parker - Annunciation Road - Parker - Tremont - Hillside - Calumet - Parker Hill Avenue-Parker Street - Fisher Avenue - Resthaven - Baptist Hospital - Parker Hill Avenue - Hillside - Darling - Pequot - Wait - Huntington-Brigham Circle.

- ***Green Route 3***- Brigham Circle - Tremont - St. Alphonsus - Calumet - Parker Hill Avenue - Parker Street - Fisher Avenue - Resthaven - Baptist Hospital - Parker Hill Avenue - Hillside - Darling - Pequot - Wait - Huntington - Brigham Circle.

All service starts and ends at Brigham Circle (Osco parking lot). There is no service on Sundays, State, Federal or Suffolk County holidays. Service frequency is as follows:

7:00 AM to 9:30 AM	**10:30 AM to 1:30 PM**	**2:00 PM to 6:40 PM**	**7:30 PM to 9:00 PM**
Blue Route Daily every 1/2 hr.	Red Route Daily every 1/2 hr.	Green Route Daily every 20 mins.	Blue Route Daily every 1/2 hr. Saturday to 7:00 PM only

The fare is $ .50 per adult or New England Baptist Hospital employee; $ .25 per senior citizen or child.

1.6.3 Commuter Rail

There are currently two commuter rail lines which service the Mission Hill area on weekdays: the Needham line and the Attleboro/Stoughton line. Both lines stop at Ruggles Station of the Orange Line, which is approximately 1 mile from the Hospital. During morning peak hours, the Needham line runs inbound trains approximately every 30 minutes, and during afternoon peak hours, trains run outbound approximately every 35 minutes. The Attleboro/ Stoughton line has less regular service in the morning, with only three inbound trains during morning peak hours, but it has trains about every 20 minutes during the afternoon peak hours. Neither line offers any service to Ruggles Station on weekends and holidays; users must utilize Back Bay or South Station at those times in order to access the Hospital.

2.0 1998 NO-BUILD CONDITIONS

In accordance with the BRA's scoping determination, the design year for the No-Build analysis is 1998. Forecasts of vehicular traffic for this design year takes into account traffic due to two sources:

- Background traffic growth due to developments located outside the study area, but contributing to the traffic network.

- Traffic due to other developments (under construction or approved) located within the study area and affecting individual intersections.

The combination of both background and other development traffic, added to existing traffic volumes, constitutes the No-Build traffic forecast.

2.1 Background Traffic Growth

Background traffic growth was estimated to be 1%. This rate was selected following consultation with BTD, and the rate was applied to all through-traffic movements on each roadway studied.

2.2 Other Development Traffic

Table III.2-1 lists proposed development projects that are under construction or approved that may affect traffic at the intersections analyzed. The BRA and BTD requested that the effects of each of these projects be included in the 1998 No-Build analysis for the Project. These projects were discussed with both the BRA and BTD, and they concurred in their selection. It should be noted that all projects are outside of the immediate study area. Trip generation data for these developments was obtained from the project impact reports.

2.3 1998 No-Build Traffic Volumes and Operations

The combined background traffic growth and traffic from other developments were distributed throughout the study area roadway network in order to evaluate the 1998 No-Build traffic conditions. The vehicle trips from the other developments under construction or approved within the study area were incorporated as through traffic entering and exiting the major roads near the site. The inclusion of the 1.0% background growth rate with these other development vehicle trips resulted in the 1998 No-Build traffic volumes shown on Figures III.2-1 and III.2-2.

As shown in Table III.2-2, the continued growth of traffic, as well as construction of the background projects in the Longwood Medical Area, will result in LOS F conditions at Huntington Avenue's intersection with South Huntington Avenue in the AM peak hour. This intersection will continue to operate at LOS D during the afternoon peak hour. The LOS at Huntington Avenue's intersection with Parker Hill Avenue will decline from B to C in the PM. Of the two unsignalized intersections, one approach, New Heath Street at Parker Street, is anticipated to decline from LOS B to C in the AM peak hour.

Table III.2-1 Other Developments under Construction or Approved within the Study Area

	Development Name	Proposed Land Use(s)	Expected Completion Year	Peak Hour Trips Added to NEBH Study Area AM	Peak Hour Trips Added to NEBH Study Area PM
1.	Beth Israel Hospital	Clinical Center (Medical, Retail, Clinical) 385,000 SF 700-710 space garage 172,000 SF Research North (Research) 110,000 SF	1996	67	77
2.	Massachusetts College of Pharmacy and Allied Health Sciences	Research and Academic 172,000 SF	1998	1	4
3.	Harvard Institutes of Medicine	Biomedical Research 294,300 SF	1998	22	16
4.	Dana-Farber Cancer Institute	Research Building 213,592 SF 246 space garage	1998	7	6

Sources:

1. **Beth Israel Hospital,** ***Clinical Center and Research North, FPIR***, VHB, Inc., November 1992.
2. **Massachusetts College of Pharmacy and Allied Health Sciences Project,** ***FPIR/FEIR***, HMM Associates, Inc., June 1993.
3. **Harvard University,** ***Harvard Institutes of Medicine, Draft Environmental Impact Report***, *VHB, Inc.*, September, 1993, and ***Final Environmental Impact Report***, VHB, Inc., December, 1993.
4. **Dana Farber Cancer Institute,** ***DPIR/DEIR***, HMM Associates, Inc., November 1993.

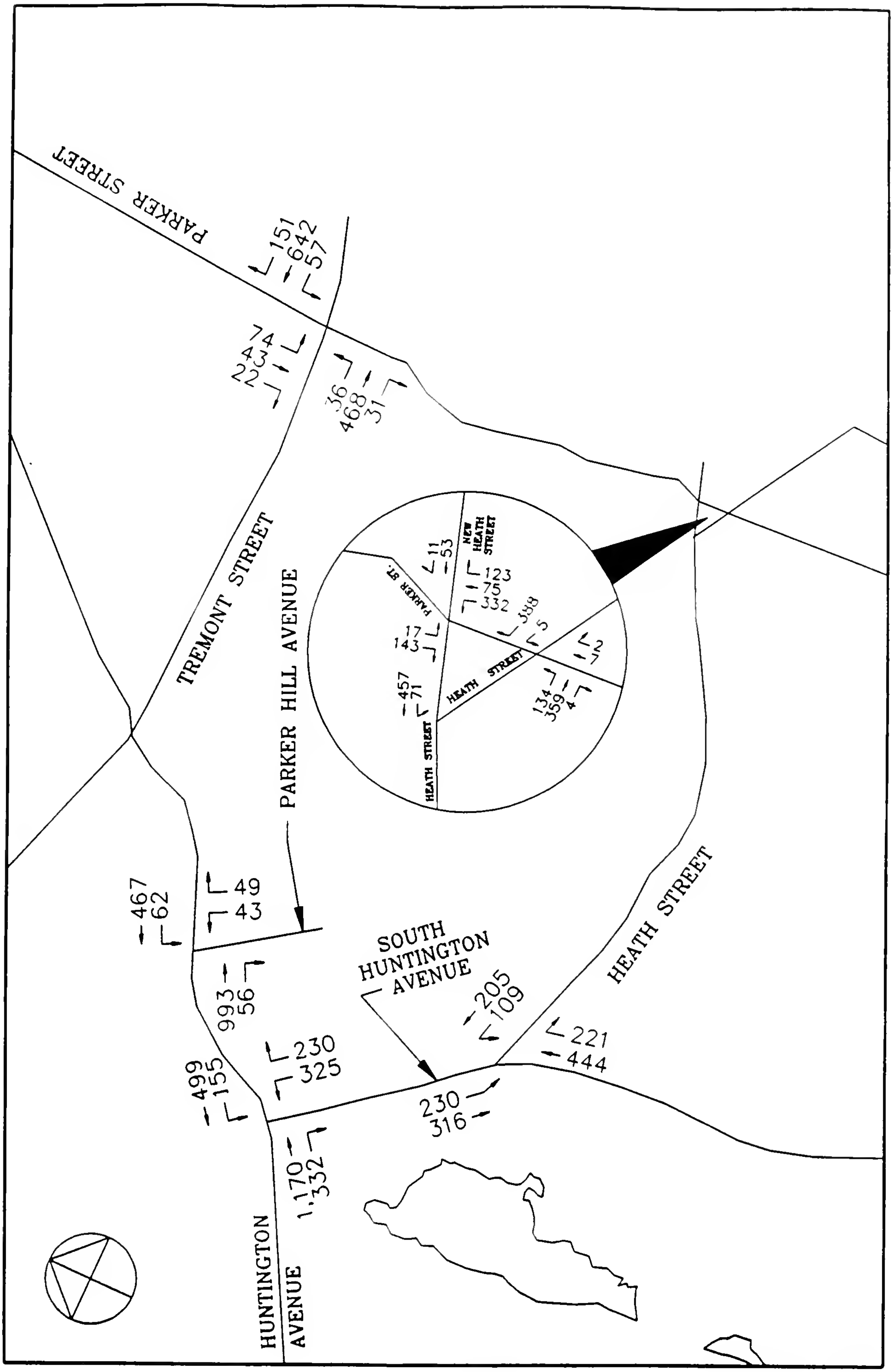

FIGURE III.2-1
1998 NO BUILD AM PEAK HOUR VOLUME
NEW ENGLAND BAPTIST HOSPITAL

HMM Associates, Inc.

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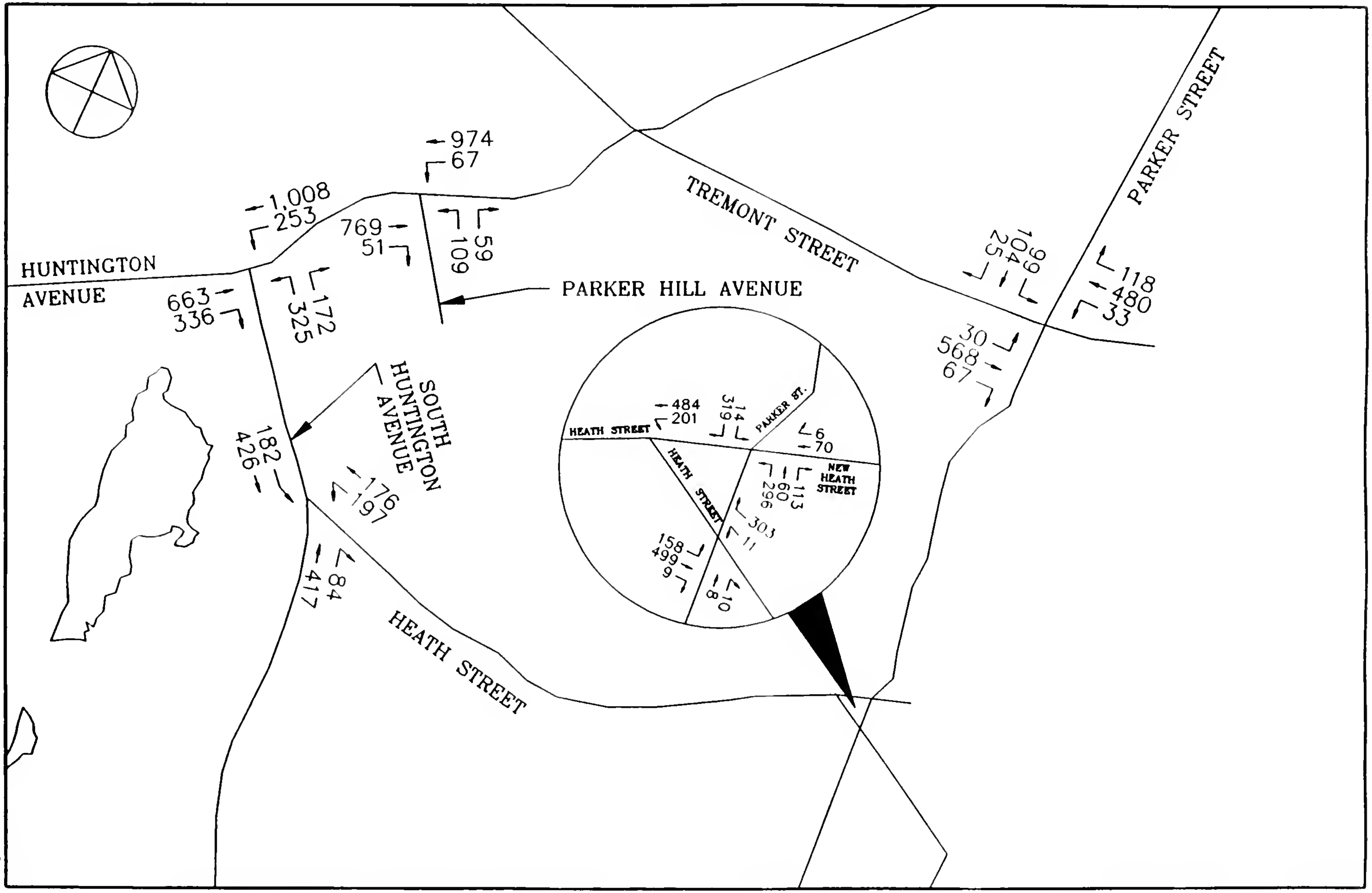

FIGURE III.2-2
1998 NO BUILD PM PEAK HOUR TRAFFIC VOLUMES
NEW ENGLAND BAPTIST HOSPITAL

Table III.2-2 1998 No-Build Peak Hour Levels of Service

Signalized Intersections

Location	AM Peak LOS	AM Peak Delay Seconds)	PM Peak LOS	PM Peak Delay (Seconds)
• South Huntington Ave./Huntington Ave.	F	63.0	D	31.1
• Huntington Ave./Parker Hill Ave.	B	9.7	B	16.2
• Tremont St./Parker St.	B	11.1	C	24.9

Unsignalized Intersections

Location	AM Peak LOS	AM Peak RC	PM Peak LOS	PM Peak RC
• Heath St./Parker St.				
LT from Heath EB:	A	580	A	680
LT from Heath WB:	A	795	A	683
All moves from Boston Housing Authority Driveway:	B	306	B	360
LT from Parker NB:	A	670	A	751
LT from Parker SB:	A	830	A	883
All moves from New Heath St.:	C	295	B	318
All moves from Heath SW	B	303	F	-160
• South Huntington Ave./Heath St.				
LT from So. Huntington SB:	A	461	A	512
All moves from Heath St.:	F	-42	F	-160

RC = Reserve Capacity.

EB = Eastbound

WB = Westbound

SB = Southbound

NB = Northbound

LT = Left turn

3.0 1998 BUILD CONDITIONS

3.1 Trip Generation

3.1.1 Proposed Project

Vehicle trips to and from a site can be estimated by several means. One option is to use data published by the Institute of Transportation Engineers (ITE) in the manual entitled *Trip Generation* (5th Edition, 1991). This publication contains trip generation rates for a wide variety of land uses. These vehicle trip rates are obtained from nationwide studies and are normally suitable for design purposes.

An alternative to the ITE data is the use of site specific data based on actual employee travel patterns. This approach was selected because its findings are more descriptive of a local hospital operation, such as NEBH's.

Based upon the addition of 22 physician and 55 support staff trips, new peak hours from the employee survey and the modal share data described in Section 1.4.1 was utilized to identify the new peak hour person-trips that the project will generate. Table III.3-1 summarizes the results by mode.

Table III.3-1 Employee Generated Peak Hour Trips By Mode

	AM Peak Hour			PM Peak Hour		
Mode	Enter	Exit	Total	Enter	Exit	Total
Drive Alone	26	1	27	0	18	18
Carpool	3	0	3	0	2	2
MBTA	5	0	5	0	3	3
Mission Link Bus	1	0	1	0	1	1
Walk	1	0	1	0	1	1
Other	1	0	1	0	1	1

In addition to employee traffic, the Project will generate 603 outpatient and physician patient trips on a daily basis. Based upon the previously described peak hour distributions, this represents four total trips in both peaks.

3.2 Trip Distribution

According to the 1994 Employee Travel Survey, 13% of all employees arrive from the south and west via Huntington Avenue northeast to Parker Hill Avenue. An additional 5% of the south and west trips arrive via Huntington Avenue to South Huntington Avenue and Heath Street; 24% travel northwest on South Huntington Avenue to Heath Street; 2% along the back of Parker Hill from South Huntington and 8% along New Heath Street and Parker Street to Parker Hill Avenue. Approximately 10% of trips arrive from Huntington Avenue SB to Parker Hill Avenue; 5% along Calumet Street; 15% on Alphonsus and 18% on Parker Street. Departures remain the same except for the 18% Parker Street trips which must use Alphonsus to reach Tremont Street and Columbus Avenue. These distribution patterns have been utilized in the distribution of build trips.

3.3 1998 Build Traffic Volumes and Operations

As shown in Table III.3-2 the Project-Generated trips will result in a slight change in No-Build levels of service at only one intersection - Tremont St./Parker St. At this intersection, the PM LOS of C in the No-Build scenarios declines to D. However, the increase in delay is only 1.2 seconds, which is negligible (see Figures III.3-1 and III.3-2).

3.4 1998 Build Parking Conditions

In accordance with the BRA scoping requiring the Transportation Access Plan to evaluate project related impacts as well as Institutional Master Plan impacts, future employee projections for the Ambulatory Care Building are added to the additional Master Plan projects to be completed over the next five years to develop campus parking requirements. Using the same employee trip modes as existing projections, the demand for employee (long-term) parking spaces will increase by 113, without mitigation provided by the Hospital's ongoing transportation demand management program. Short-term demand for physician, patients and outpatients will increase by 54 spaces from current conditions with daily demand increasing by 163 vehicles/day. The change in short-term demand between the Build and No-Build conditions is 38 spaces. Overall, there will be a 170 space shortfall even with the new spaces (see Table III.3-3). Section 4.0 details the mitigation plan that the Hospital will implement to reduce overall employee parking demand.

3.5 Site Circulation

Figure III.3-3 shows the proposed site circulation plan including access points for vehicles and pedestrians. Sight distances for the proposed drive were calculated by H.W. Moore Associates and HMM Associates in December 1993, and January 1994, respectively. According to the analysis, the new drive will have a total westerly sight distance of 411 feet, compared to the existing drive's 403 feet. Easterly site distances are considered unlimited.

According to the Institute of Transportation Engineers (ITE) vehicles exiting the Hospital require a 300' sight distance for left turns and a 260' sight distance for right turns at a speed of 20 mph, which is representative of conditions along Parker Hill Avenue. Similarly, vehicles turning left into the Hospital from Parker Hill Avenue require a 240' distance. Thus, comparing the sight distances at the proposed driveway with the ITE recommended sight distance, the driveway conforms to ITE recommended distances along Parker Hill Avenue at the observed speed.

3.6 Transit

The Project is expected to increase public transportation use by approximately 5 passenger trips during the AM peak hour and by 3 during the afternoon peak hour. The projections reflect an insignificant increase in ridership which will easily be absorbed by the MBTA. There will be 1 new trip generated for the Mission Link bus during both peak hours as well.

3.7 Pedestrian Impacts

The Project is not expected to generate significant pedestrian trips due to the site's limited accessibility by foot, and the nature of the patient or outpatient population. Only 1 new pedestrian trip in each of the AM and PM peak hours can be anticipated from the Project.

3.8 Construction Management

The Hospital will develop a Construction Management Plan (CMP) to address pertinent construction issues. Chapter IV, Section 6.0 of the DPIR discusses construction impact issues including the proposed schedule, staging areas and truck routing plan. The Construction Management Plan will include provisions for the following measures:

- Secure staging, fencing and bracing will be provided to protect nearby pedestrian traffic.

Table III.3-2 1998 Build Peak Hour Level of Service

Signalized Intersections

Location	AM Peak LOS	AM Peak Delay	PM Peak LOS	PM Peak Delay
• South Huntington Ave./Huntington Ave.	F	64.1	D	31.2
• Huntington Ave./Parker Hill Ave.	B	9.7	B	16.9
• Tremont St./Parker St.	B	10.3	D	26.1

Unsignalized Intersections

Location	AM Peak LOS	AM Peak RC	PM Peak LOS	PM Peak RC
• Heath St./Parker St.				
LT from Heath EB:	A	578	A	680
LT from Heath WB:	A	795	A	682
All moves from Boston Housing Authority Driveway:	B	305	B	359
LT from Parker NB:	A	670	A	751
LT from Parker SB:	A	828	A	883
All moves from New Heath St.:	C	294	B	318
All moves from Heath SW	B	303	F	-165
• South Huntington Ave./Heath St.				
LT from So. Huntington SB:	A	459	A	512
All moves from Heath St.:	F	-49	F	-168

RC = Reserve Capacity.

EB = Eastbound

WB = Westbound

SB = Southbound

NB = Northbound

LT = Left turn

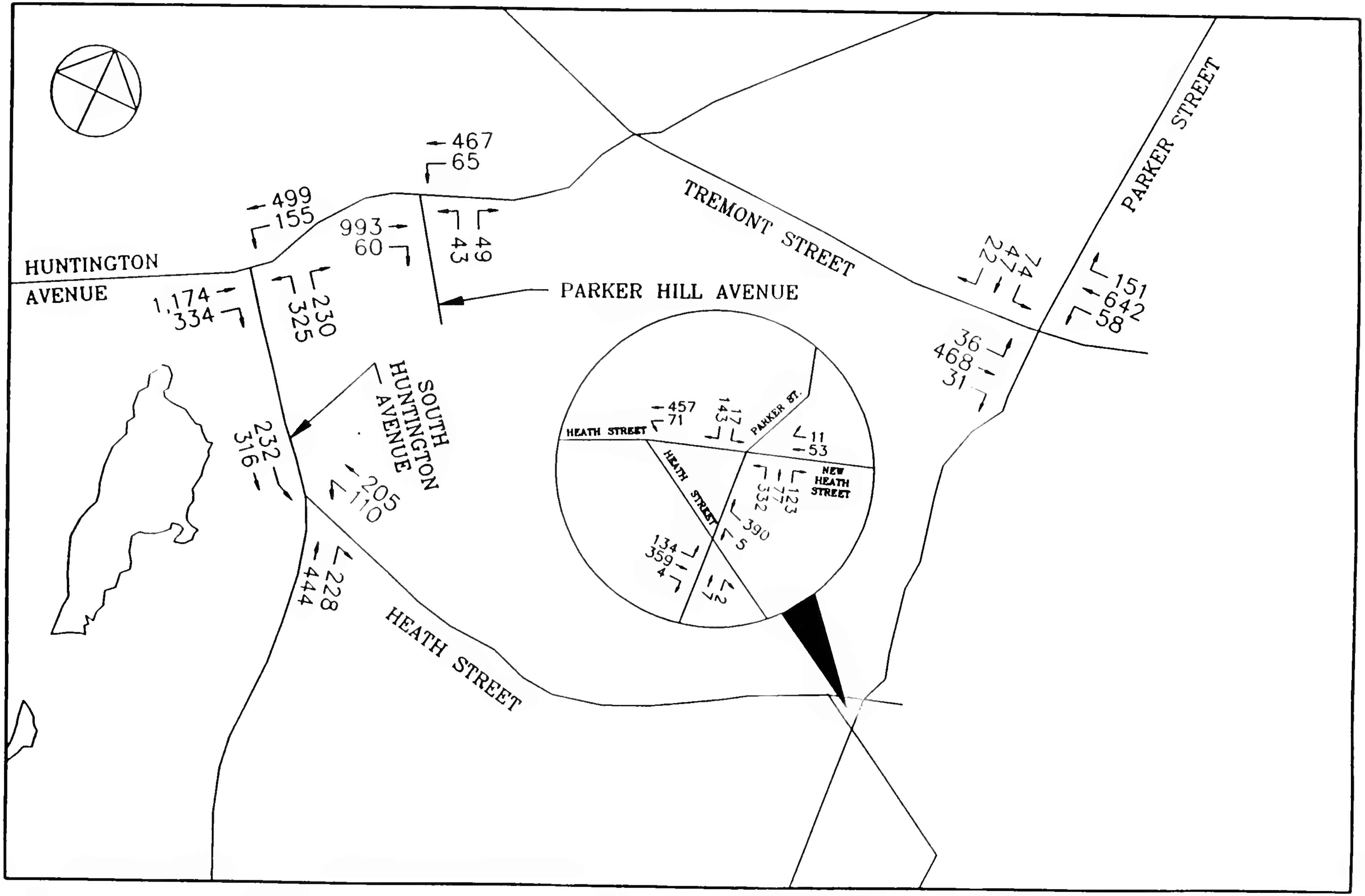

FIGURE III.3-1
1998 BUILD AM PEAK HOUR TRAFFIC VOLUME
NEW ENGLAND BAPTIST HOSPITAL

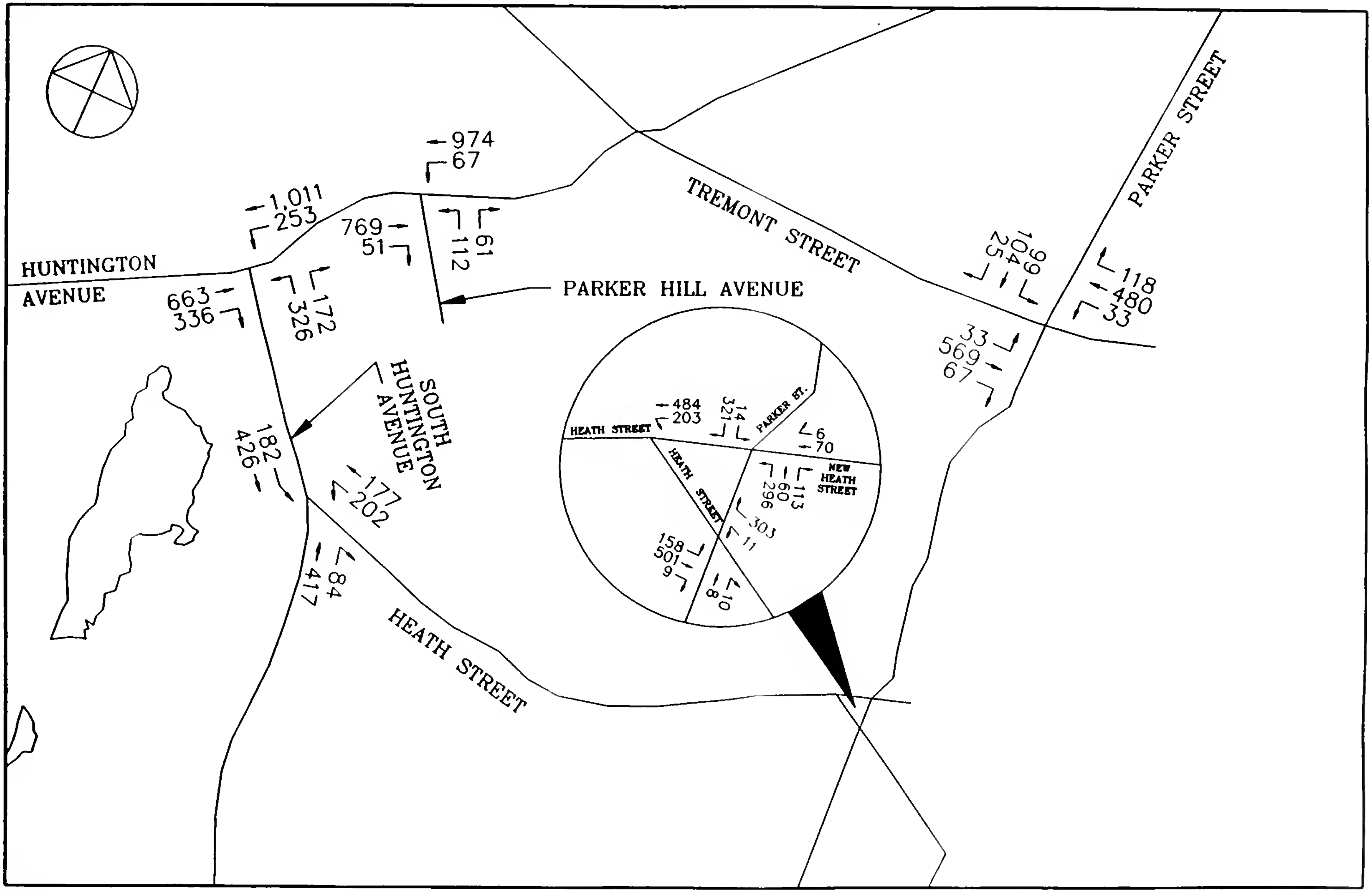

FIGURE III.3–2
1998 BUILD PM PEAK HOUR TRAFFIC VOLUMES
NEW ENGLAND BAPTIST HOSPITAL

HMM Associates, Inc.

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Table III.3-3 1994 Existing, 1998 No-Build, and 1998 Build Parking Demand

EMPLOYEES

Year	Total Employees	% Day Shift	Auto Mode Split	Auto Occupancy	Daily Autos (One Way)	Daily Turnover Rate (Utilization)	Employee Parking Demand (Long Term)
1994 Existing	1,200	83%	75%	1.06	705	1.0	705
1998 No-Build	1,300	83%	75%	1.06	763	1.0	763
1998 Build	1,377	84%	75%	1.06	818	1.0	818

VISITORS/PATIENTS/OUTPATIENTS

Daily Visitors/ Patients/ Outpatients	Auto Mode Split	Auto Occupancy	Daily Autos (One Way)	Daily Turnover Rate (Utilization)	Visitors/ Patients/ Outpatient Parking Demands (Short Term)	Total Parking Demand (Employees and Visitors/Out-patients)	Total Parking Supply	Parking Deficit
440	100%	1.0	440	3.0	147	852	595	257
832	100%	1.0	489	3.0	163	926	595	331
925	100%	1.0	603	3.0	201	1,019	849	170

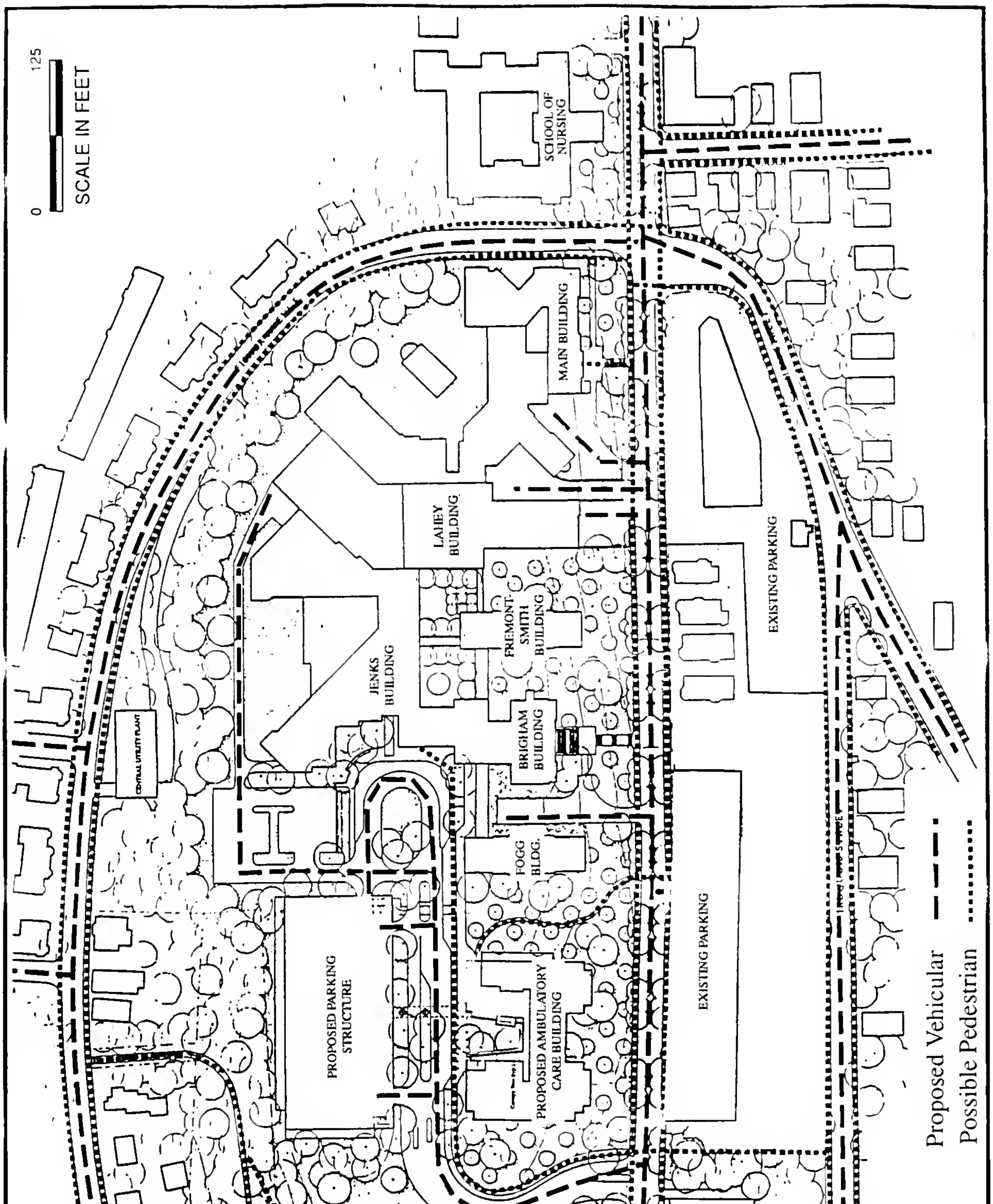

FIGURE III.3-3
SITE CIRCULATION PLAN

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- Pedestrian walkways will be covered at appropriate construction locations.

- The removal of construction material and equipment will be staggered over the course of the weekday.

- Designated truck routes for the removal of construction equipment will be clearly defined.

- The arrival and departure times of construction workers will generally be during the off peak hours of commuter traffic.

3.9 Trucks and Service Vehicles

Truck loading and deliveries currently operates from the Hospital's one loading dock at its central receiving area in the front of the Lahey Building along Parker Hill Avenue. All Hospital deliveries are routed through this central receiving area. According to Hospital officials, most deliveries occur in the morning hour between 6:00 AM and 12:00 Noon involving on average eleven trucks per day. The majority of these trucks are vans and other single unit delivery vehicles. The Hospital is currently in the process of consolidating shippers which should lead to a 20-30% reduction in these total daily trucks. A secondary loading area for maintenance shop deliveries will continue to operate at the maintenance shop behind the School of Nursing with access from Parker Hill Avenue.

The Project is not expected to lead to increases in truck trips over present conditions.

4.0 TRANSPORTATION MITIGATION MEASURES

The completion of the project will result in an increase in demand for parking. While the supply of parking at NEBH will increase with construction of the Parking Structure, the demand will continue to exceed supply without implementation of strategies designed to reduce single occupant vehicle use by Hospital employees. To accomplish this necessary reduction, New England Baptist Hospital will expand its existing transportation demand management program, as discussed in the following paragraphs.

4.1 Demand Management Incentives

Educate Employees

The Hospital educates each current and prospective employee about available commuting options and the benefits and costs of each. This process helps

inform employee attitudes about driving alone versus other commuting modes.

The Hospital also periodically provides literature to its employees on mass transit fares, schedules, and routes; the availability of ridesharing options, MBTA T-pass programs and off-campus parking lot locations; and lists of carpools and vanpools looking for riders.

Promote Mass Transit

The Hospital currently sells MBTA monthly T-passes to employees at an on-site location. The Hospital hopes to increase MBTA ridership by all employees to 15% by 1998.

Promote Ridesharing

NEBH will continue to develop programs designed to increase ridership by its employees. As shown in Table III.4-1, by 1998 it hopes to have 15% of all employees either carpooling or vanpooling. Some NEBH employees are apprehensive about ridesharing because of a fear of not being able to get home in the event of an emergency. Therefore, NEBH is exploring formalizing its Emergency-Ride-Home program so that employees belonging to a carpool/vanpool who are confronted with an emergency during working hours can get a ride home. The vehicle used would be either the NEBH shuttle van (schedule permitting) or a local taxi company (via an NEBH voucher arrangement).

Establish Alternative Work Hours

To the extent feasible, the Hospital allows employees to work flexible hours in order to allow them to select from numerous transit schedule times without being pressured to arrive at a specific time. This helps increase the percentage of employees arriving by public transit. Flexible work hours also make it easier for employees to form carpools. By adjusting the arrival and departure times of employees, area-wide vehicle congestion can be substantially reduced during peak hours.

Encourage Walking/Cycling

In order to facilitate the goal of having more employees walk or bicycle to work, the Hospital is improving the lighting around its campus, as described in the Landscape Improvements section. In that regard, the Hospital is also providing increased security patrols. The Hospital already provides bike racks/cages.

4.2 Impact of Mitigation Measures on Future Parking Demand

Implementation at the above measures described in Section 4.1 will result in a significant decrease in employee parking demand. However, as shown in Table III.4-2 the overall demand will continue to exceed supply, but by a more manageable amount.

4.3 Periodic and Long-Term Project Impact Monitoring

New England Baptist Hospital will continue to expand its transportation demand management program, which is designed to reduce single occupancy vehicle use by its employees. The plan will include continued sales of transit passes and maintenance of a successful rideshare program. Both periodic and long-term monitoring of Project impacts will be established by the Hospital in accordance with the requirements of Article 27M of the Boston Zoning Code.

Table III.4-1 Mitigated Modal Share (Person Trips)

Mode	% Share	
	Existing Overall	Mitigated
Drive Alone	66%	55%
Carpool/vanpool	9%	15%
MBTA	11%	15%
Mission Link	4%	5%
Walk	5%	5%
Other	5%	5%
	100%	100%

Source: New England Baptist Hospital, Employee Transportation Survey, February 1994.

Table III.4-2 1998 Build Parking Demand Without and With Mitigation

EMPLOYEES

Year	Total Employees	% Day Shift	Auto Mode Split	Auto Occupancy	Daily Autos (One Way)	Daily Turnover Rate (Utilization)	Employee Parking Demand (Long Term)
1998 Build Without Mitigation	1,377	84%	75%	1.06	818	1.0	818
1998 Build With Mitigation	1,377	84%	70%	1.12	723	1.0	723

VISITORS/PATIENTS/OUTPATIENTS

Daily Patients/ Outpatients	Auto Mode Split	Auto Occupancy	Daily Autos (One Way)	Daily Turnover Rate (Utilization)	Visitors/ Patients/ Outpatient Parking Demands (Short Term)	Total Parking Demand (Employees and Visitors/Out patients)	Total Parking Supply	Parking Deficit
925	100%	1.0	603	3.0	201	1,019	849	170
925	100%	1.0	603	3.0	201	924	849	75

IV. ENVIRONMENTAL PROTECTION COMPONENT

IV. ENVIRONMENTAL PROTECTION COMPONENT

1.0 QUALITATIVE ASSESSMENT OF PEDESTRIAN LEVEL WINDS

1.1 Introduction/Overview

A qualitative assessment has been made to determine the effect of the proposed Ambulatory Care Building and Parking Structure at New England Baptist Hospital on pedestrian level winds (PLWs) at all entrances and drop-off areas. The assessment was completed by Frank H. Durgin, P.E., who has had 25 years of experience of dealing with PLWs and in reviewing Boston projects in the context of Boston's wind climate.

Because the Project site is on top of the 225 foot sharply rising Parker Hill, it is naturally windy. Currently, no location in or near the site is believed to exceed the BRA Guideline wind speed, nor is any location believed to have winds at Melbourne's Category 2 (uncomfortable for walking). The addition of the proposed buildings is expected to reduce the winds or have no effect on the winds at any of the locations studied. The two new buildings will have no effect on winds along nearby Sachem and Iroquois Streets, and Fisher Avenue.

The wind assessment has been made assuming the existing trees on site. The addition of the proposed landscaping should further reduce any windiness and will be especially effective in mitigating winds in the meadow and Fourth Tier just east of the proposed buildings.

The Ambulatory Care Building is proposed to be three stories. Usually, three story buildings would not be expected to have any problems with PLWs. However, this site is on top of a 225-foot high hill that rises sharply on all sides and is windy naturally. Thus, without careful planning, even a three-story building could affect wind conditions at any proposed entrances.

The interaction of the wind with buildings and structures is very complicated and, at times, difficult to predict, especially for an urban area such as this located on top of a hill. Thus, this evaluation provides a qualitative assessment of PLWs.

1.2 Description of the Project Area

1.2.1 Location and Project Description

The site (Figure IV.1-1) is located at the top of Parker Hill, 225 feet above sea level. The elongated top of the hill runs approximately west-northwest to

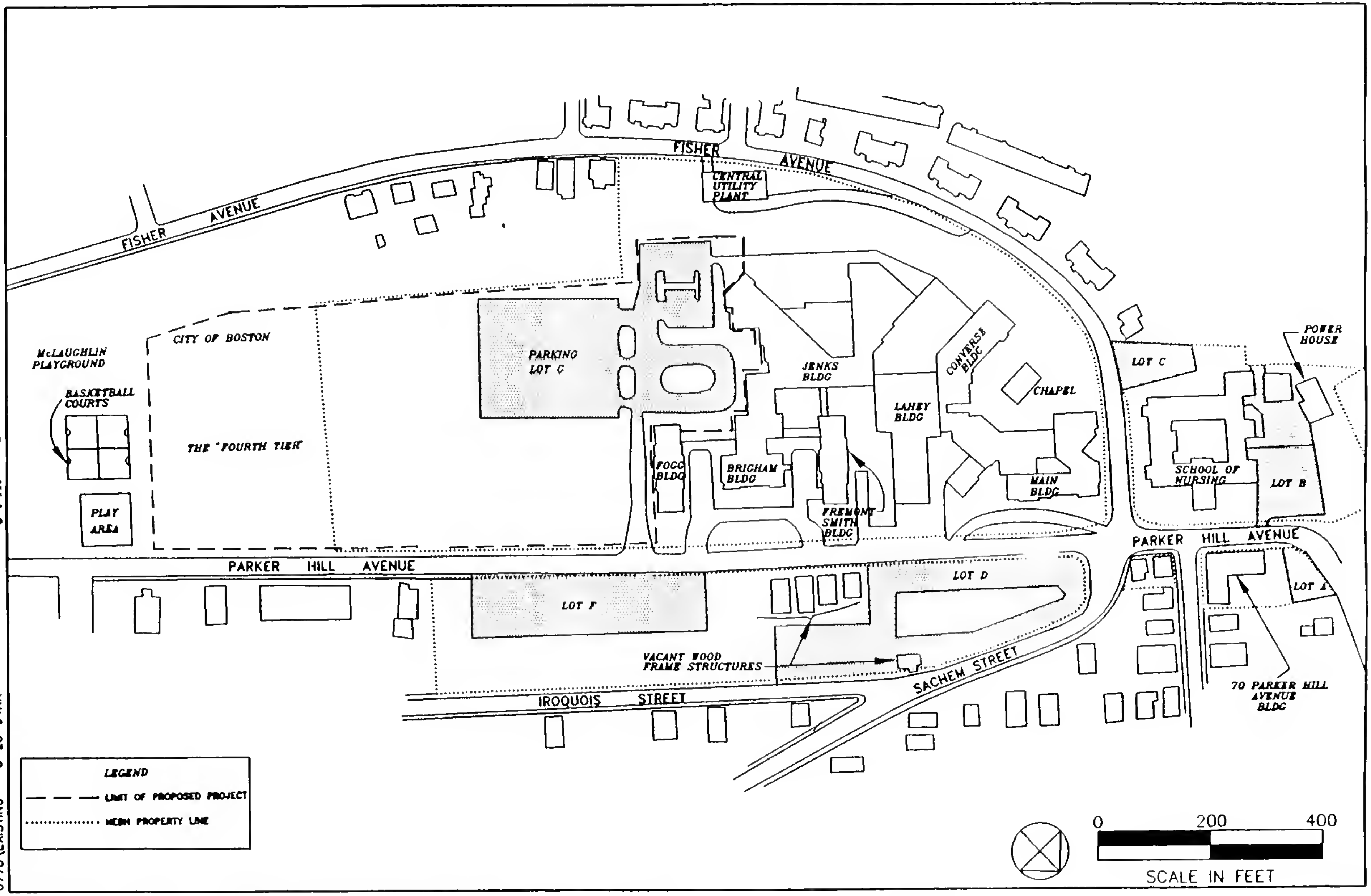

FIGURE IV.1-1
EXISTING CONDITIONS IN PROJECT VICINITY
NEW ENGLAND BAPTIST HOSPITAL

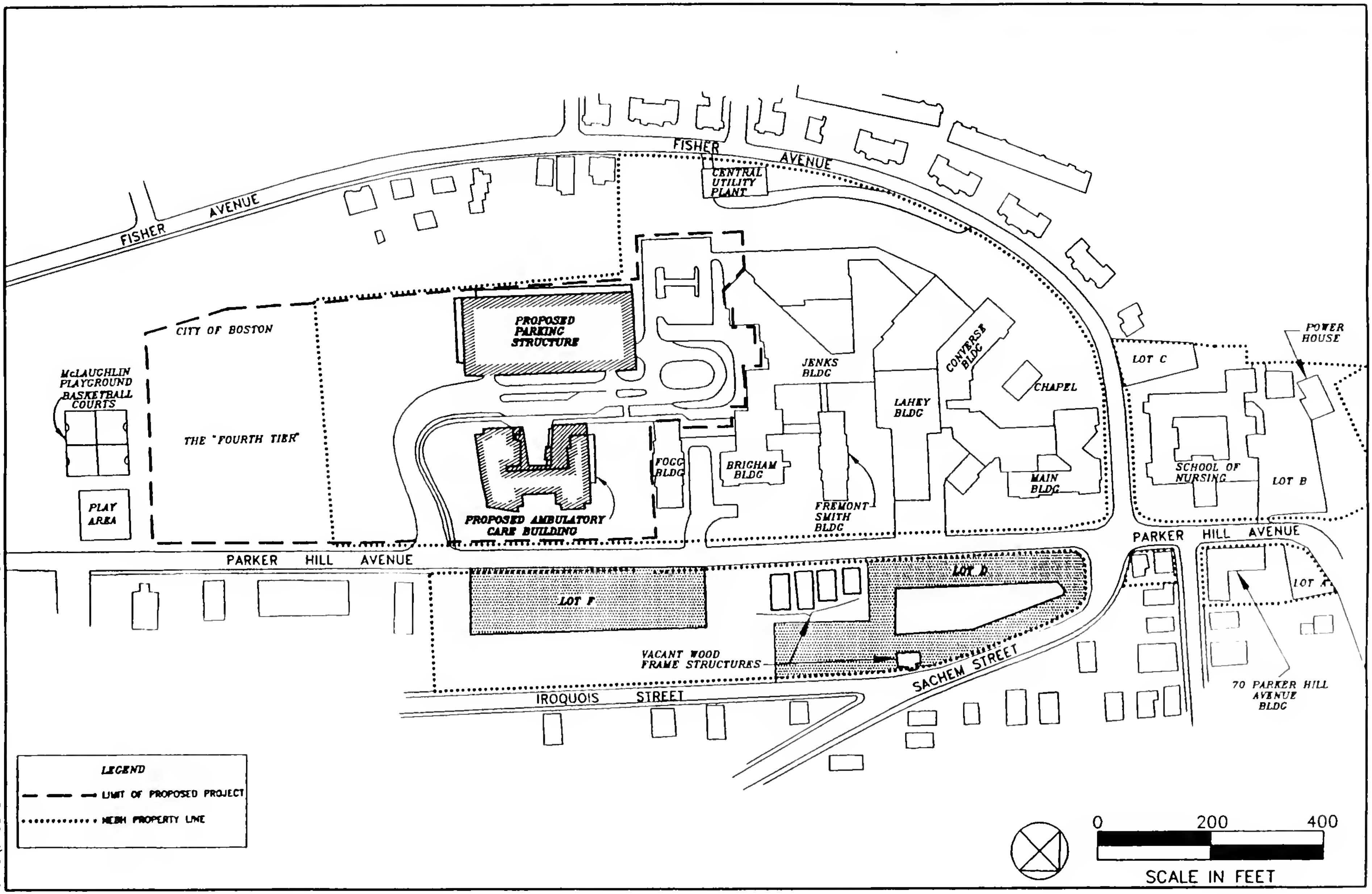

FIGURE IV.1-2
AMBULATORY CARE BUILDING AND PARKING STRUCTURE
NEW ENGLAND BAPTIST HOSPITAL

HMM Associates, Inc.
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east-southeast. The existing parts of the Hospital occupy the west-northwest end of the top of the hill and are on the south side of Parker Hill Avenue.

The proposed Ambulatory Care Building will be located just east-southeast of the existing buildings and connected by an enclosed passageway to the Fogg Building (Figure IV.1-2). The site is on the south side of Parker Hill Avenue. The proposed building will be three-stories high and be in the approximate shape of an "H".

There will be six entrances to the Ambulatory Care Building: one is through the connecting link to the Fogg Building; the second is underground from the proposed Parking Structure; the third is at the southeast corner of the west wing and at the end of the link from the Fogg Building; the fourth is in the middle of the south side of the link between the Fogg Building and the new building; the fifth is in the west side of the west wing of Ambulatory Care Building just north of the link from the Fogg Building; and the sixth is at the southwest corner of the east wing of the Ambulatory Care Building. The first four entrances are for patients and visitors, and the fifth and sixth are for employees. The first four entrances are the primary entrances and of those, only the third and fourth are exposed to the wind.

1.2.2 Surrounding Area

The surrounding area contains mostly two to four story buildings. Because Parker Hill rises sharply to 225 feet from approximately the 20 to 40 foot elevation, only those buildings on the side of the hill near its top will have any effect on winds near the top of the hill and will provide any sheltering for the Ambulatory Care Building or Parking Structure.

The only tall building near the site is the tower of the VA Hospital on South Huntington Avenue. This tower rises from the 20 to 30 foot elevation, and appears to be about the same height as the hill, but is far enough away that its primary effect will be to add turbulence and to slow down the wind from its direction.

The other Hospital buildings and trees on top of the hill currently provide protection from the wind. The other Hospital buildings are to the west-northeast and are three-stories high. There are many trees on-site, but they are deciduous, and thus are only good wind breaks when they have leaves.

1.3 The Wind Climate in Boston

1.3.1 Variation of Wind Speed With Height

In general, the natural wind is unsteady (i.e., it is gusty) and its average speed increases with height above the ground. Figure IV.1-3 depicts how the average wind speed varies with height for different types of terrain. Although unlikely, it is possible that the construction of a building will bring the higher speed winds at the top of the building down to ground level.

Because the Project is at the top of a high hill, it is very exposed and without the existing trees and buildings, winds there would be similar to or faster than those at the top of a 200-foot high building.

1.3.2 Statistical Description of the Wind

The wind data from Logan Airport, usually used to define the winds for Boston, is applicable since the project site is located about three miles west-southwest of Logan Airport. Figure IV.1-4 depicts a wind rose for Boston based on this surface wind data from Logan Airport taken from 1945 to 1965*. The length of each line radiating from the center of the figure to the outermost crossing line is proportional to the total time the wind comes from that direction. The other lines crossing the radial lines indicate the frequency of winds less than 7.5, 12, and 19 mph.

Figure IV.1-4 shows that the winds in Boston come primarily from the northwest, west, and southwest. Figures IV.1-5 through IV.1-8 show wind roses for Boston for winter (December, January and February), spring (March, April and May), summer (June, July and August), and fall (September, October and November). These figures show that northwest winds tend to occur during the colder months and southwest winds during the warmer months. Spring and fall are transitional, but winds in the spring are stronger than those in the fall. Strong easterly winds usually occur during storms when there is precipitation.

The average wind speed at Logan Airport at 58 feet (the average height at which the data was taken) is 12.9 mph. At pedestrian height (i.e., at chest height, 4.5 feet) it is about 8 mph. The average wind speed at 58 feet at Logan Airport for each month is shown in Figure IV.1-9. Seasonally the average is

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* While data from 1965 to 1991 is also available, it is not believed to be as representative of the true winds in Boston, due to the many 25 to 40 story buildings that have been built in the Financial District of Boston since 1965.

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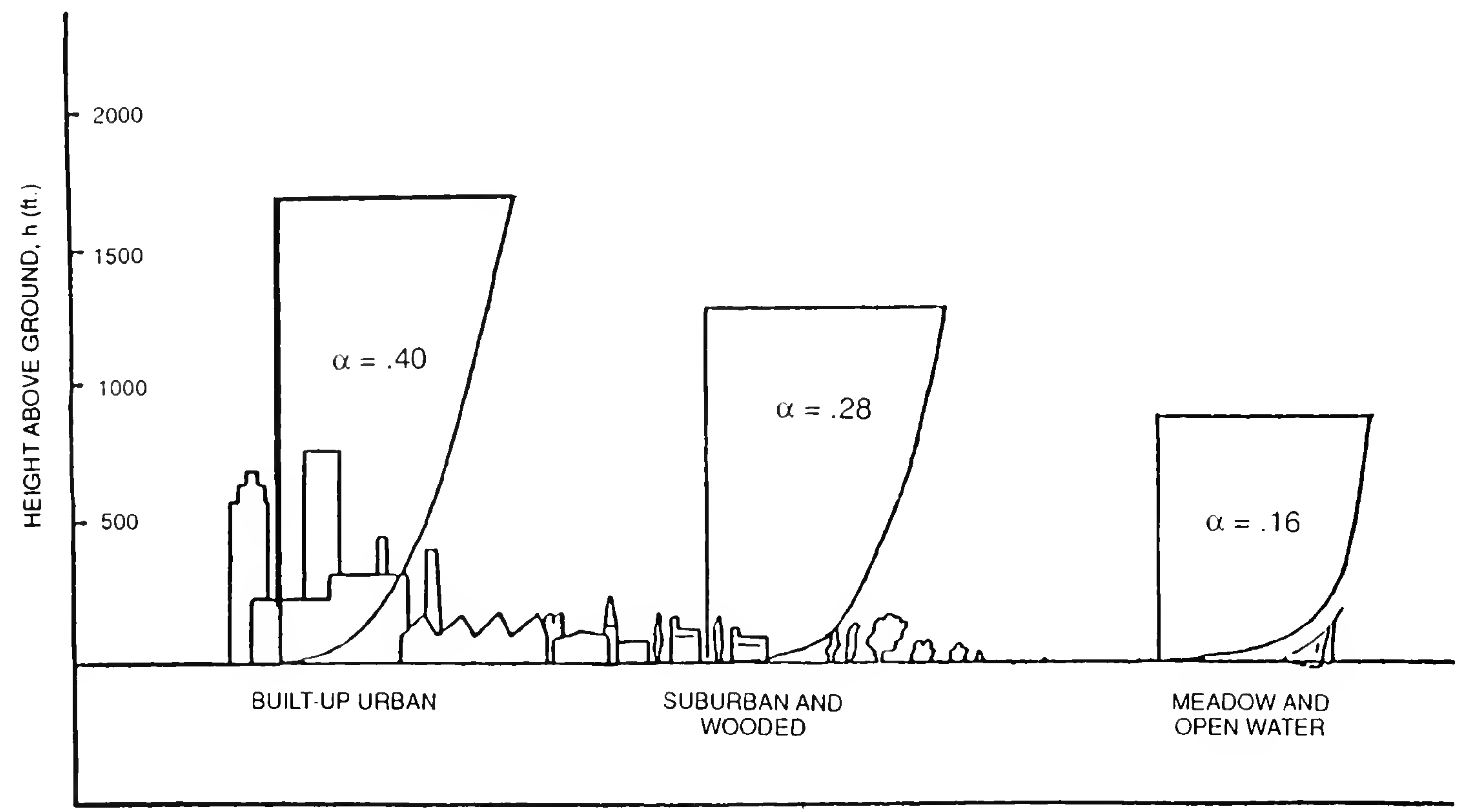
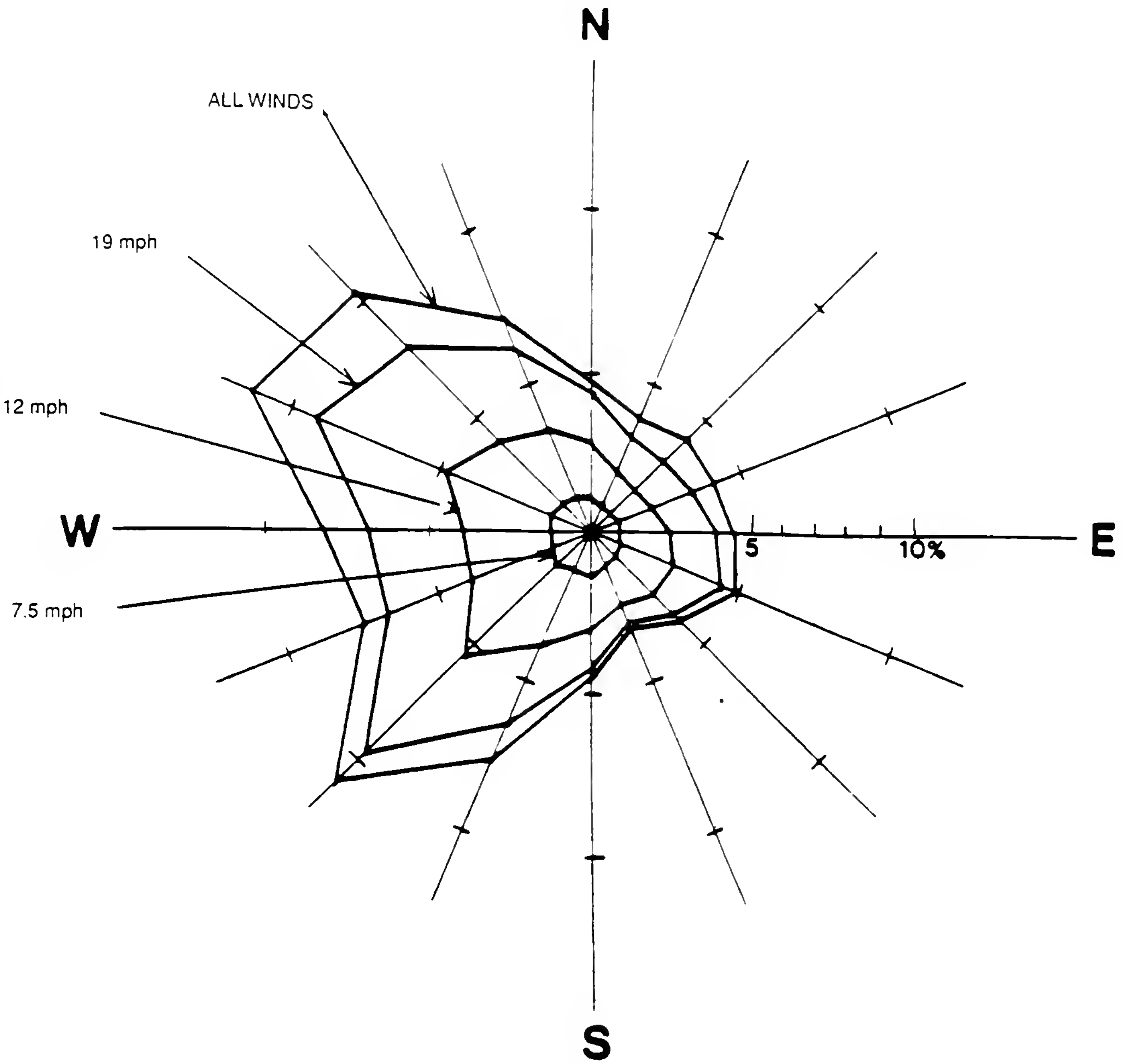


FIGURE IV.1-3
WIND SPEED VARIATIONS WITH HEIGHT



NOTE
SURFACE DATA OBTAINED FROM LOGAN INTERNATIONAL AIRPORT

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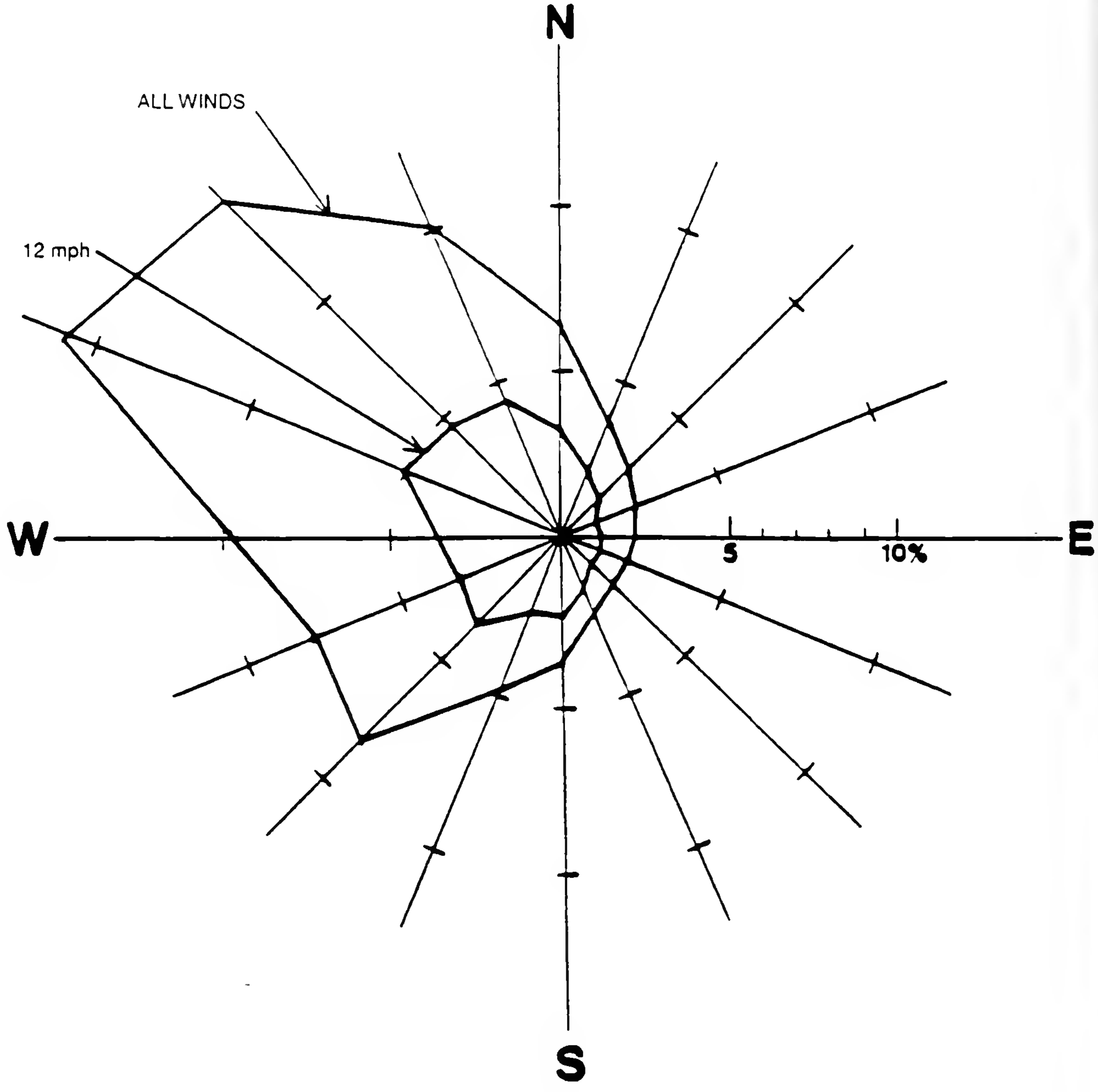
FIGURE IV.1-4
ANNUAL WIND ROSE FOR BOSTON



NOTE
SURFACE DATA OBTAINED FROM LOGAN INTERNATIONAL AIRPORT

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FIGURE IV.1-5
WINTER WIND ROSE FOR BOSTON
(DECEMBER, JANUARY, FEBRUARY)

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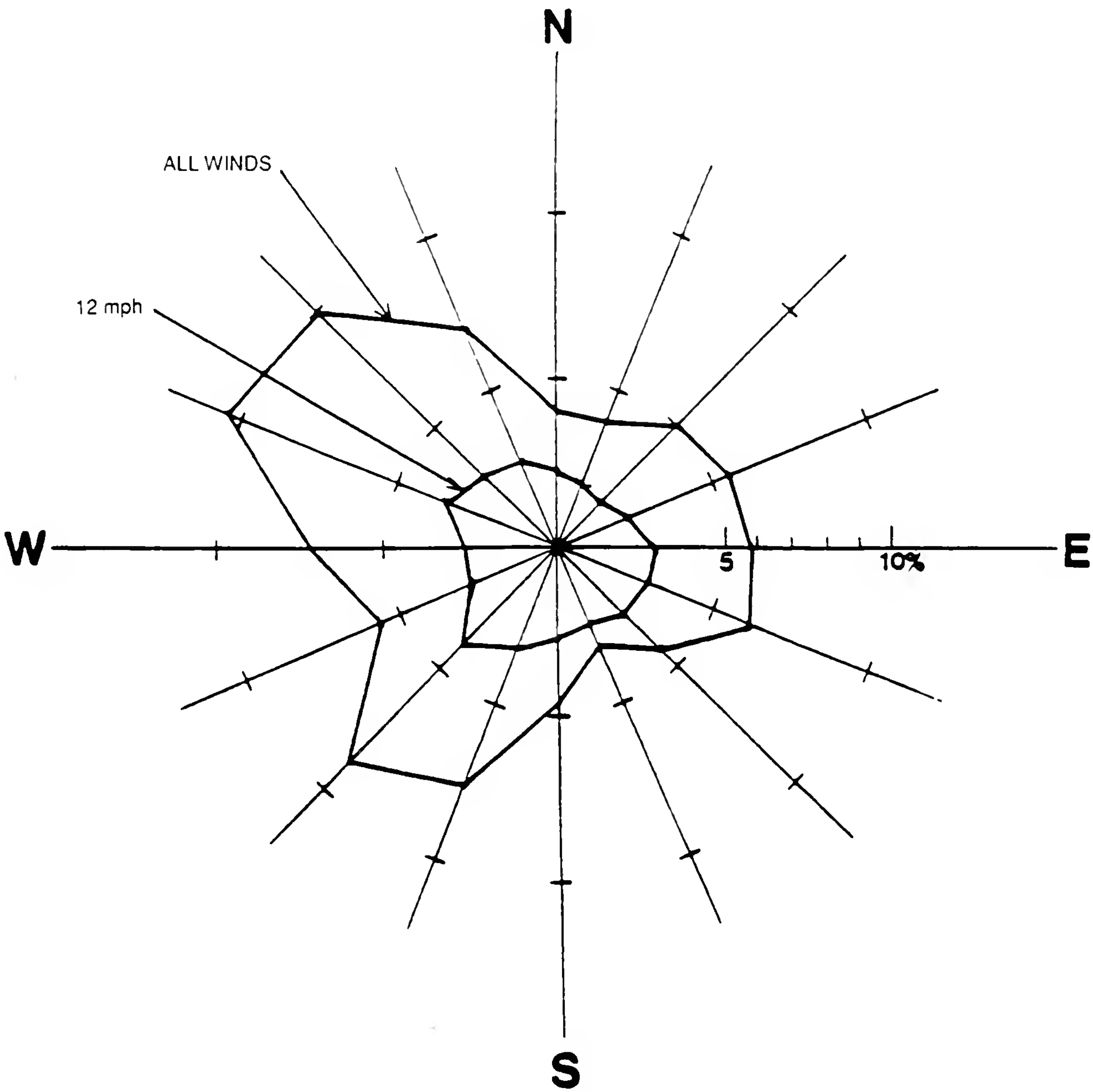

NOTE
SURFACE DATA OBTAINED FROM LOGAN INTERNATIONAL AIRPORT

FIGURE IV.1-6
SPRING WIND ROSE FOR BOSTON
(MARCH, APRIL, MAY)

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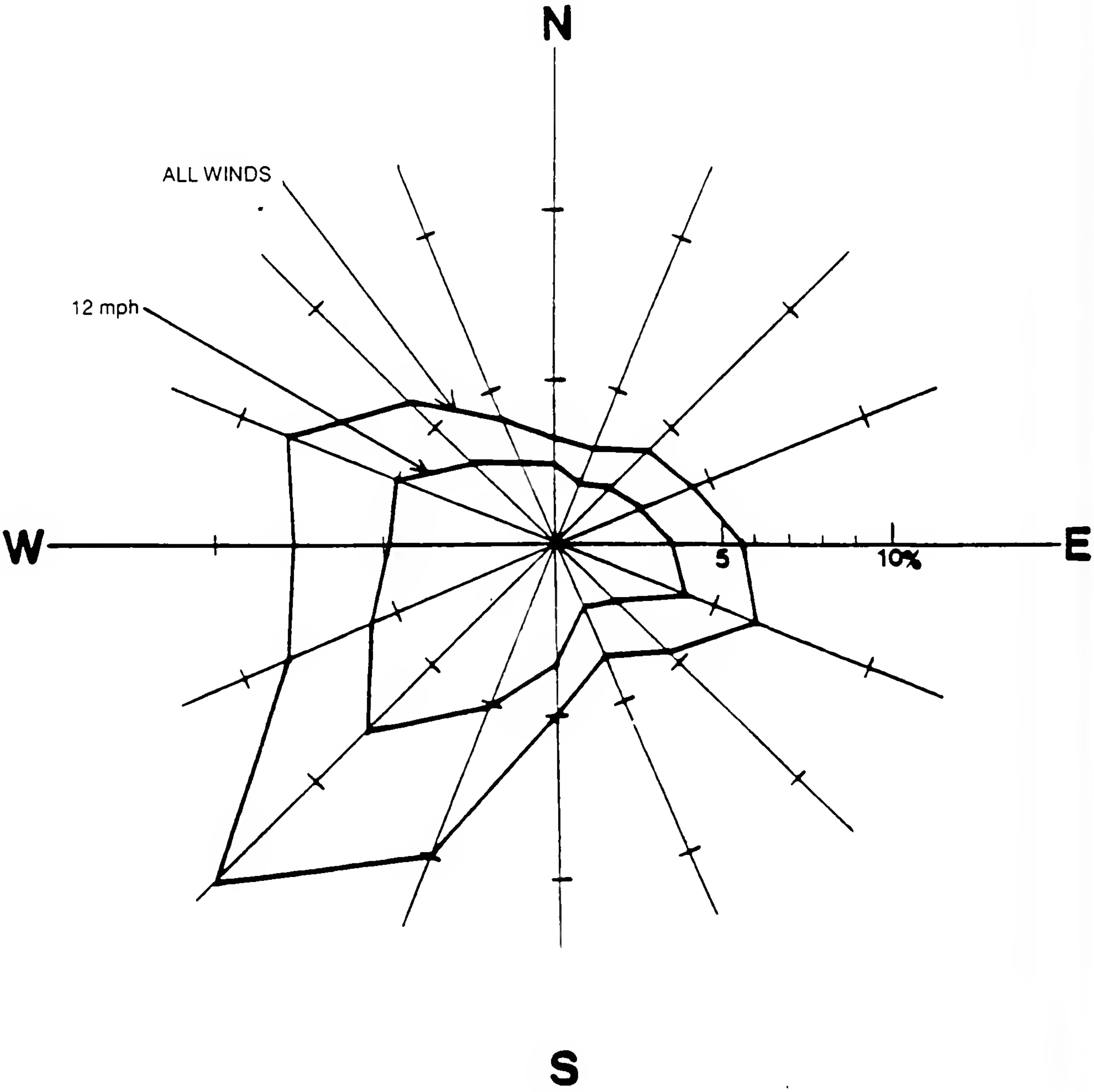

NOTE
SURFACE DATA OBTAINED FROM LOGAN INTERNATIONAL AIRPORT

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FIGURE IV.1-7
SUMMER WIND ROSE FOR BOSTON
(JUNE, JULY, AUGUST)

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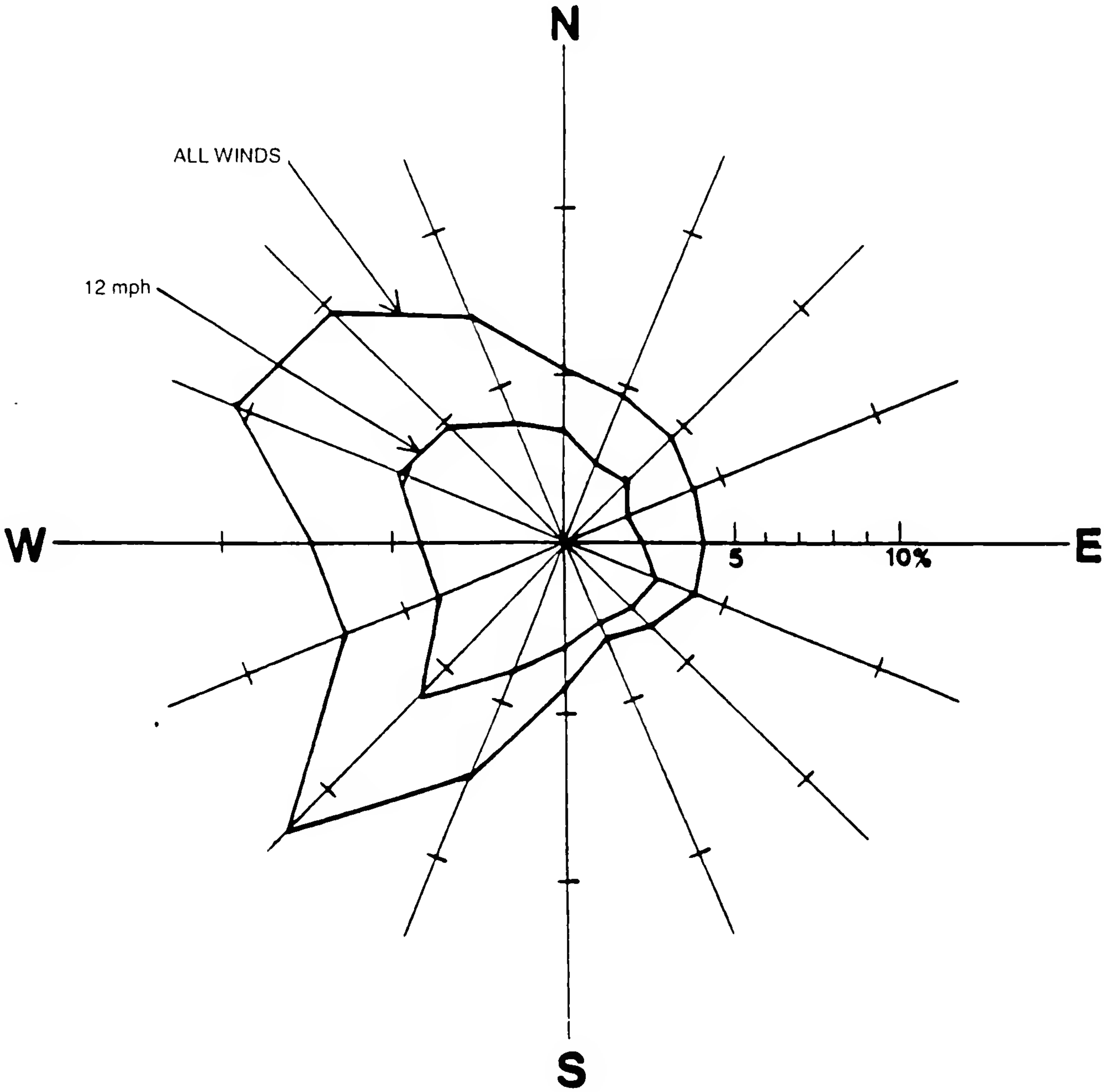

NOTE
SURFACE DATA OBTAINED FROM LOGAN INTERNATIONAL AIRPORT

FIGURE IV.1-8
FALL WIND ROSE FOR BOSTON
(SEPTEMBER, OCTOBER, NOVEMBER)

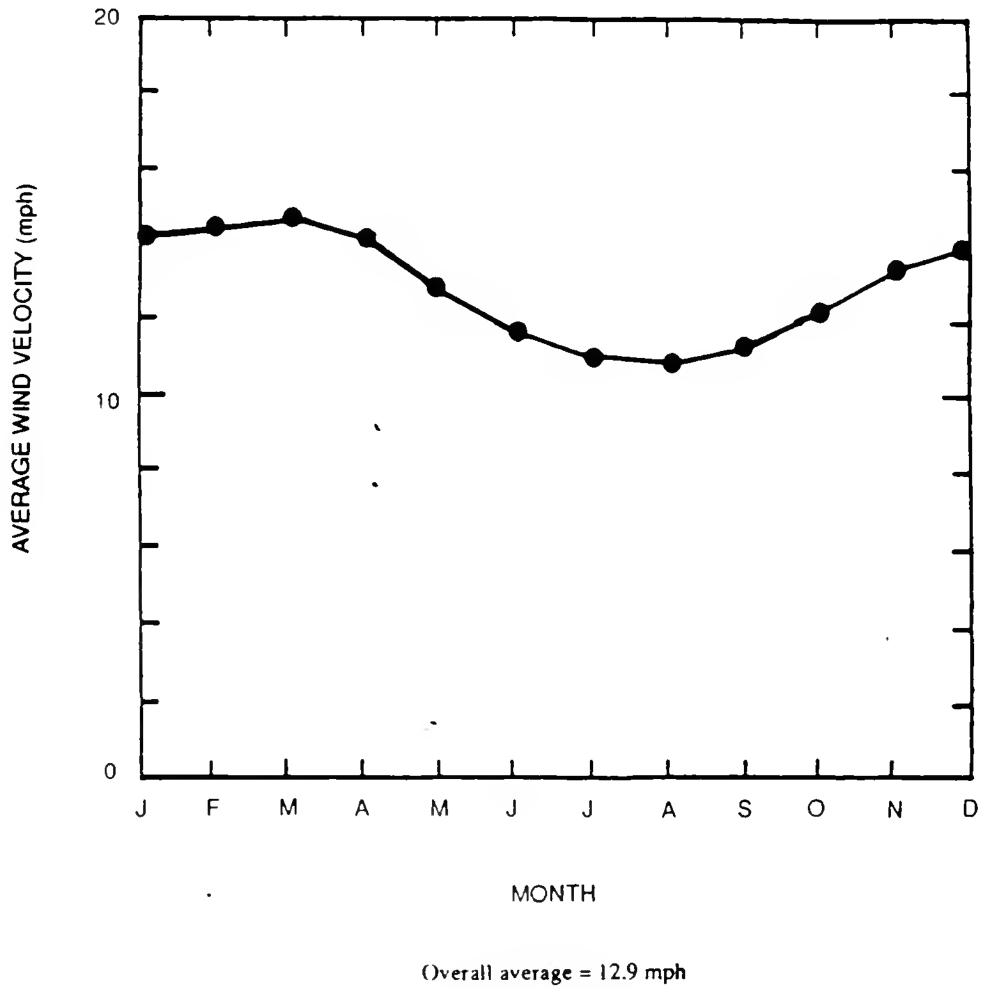

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FIGURE IV.1-9
AVERAGE WIND VELOCITY AT LOGAN AIRPORT AT 58 FEET
1945-1965 BY MONTH

14.2 mph in the winter, 13.9 in the spring, 11.2 in the summer, and 12.3 in the fall. The fastest hourly wind for a one hundred hour return period, however, is slightly faster in the spring than in the winter.

1.4 Pedestrian Level Wind Criteria

Since the early 1980s, Boston has used a guideline criteria for acceptable winds of not exceeding 31 mph effective gusts more often than once in 100 hours. The effective gust is defined as the average wind speed plus 1.5 times the root mean square (rms) variation about the average and can be thought of as a one minute gust. Based on wind data collected for Boston, this 31 mph effective gust is comparable to an average wind speed of 22.5 mph.

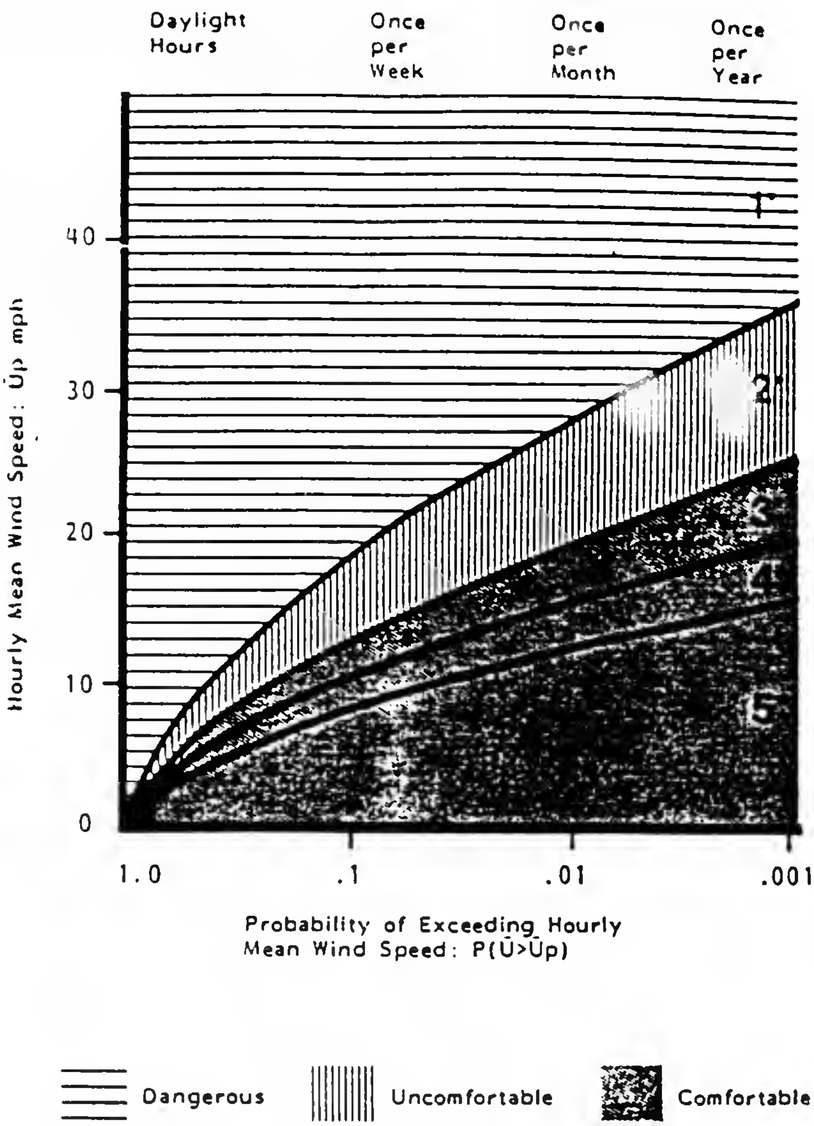
In 1978, Melbourne* developed a probability criteria for average pedestrian level wind speeds which accounted for different types of pedestrian activity as well as the safety aspects of such winds. (See Figure IV.1-10 - the Equivalent Average used in this figure is similar to an hourly average, but combines the effects of steady and gusting winds.) Melbourne defined five categories of PLWs:

1) Dangerous and Unacceptable;
2) Uncomfortable for Walking;
3) Comfortable for Walking;
4) Comfortable for Short Periods of Standing and Sitting; and
5) Comfortable for Long Periods of Standing or Sitting.

These criteria are not absolute (any location can have dangerous winds in a hurricane); rather, they imply that the location would have wind speeds such that the activity suggested is possible most of the time, and would be perceived as such by most people who frequent the location. For example, the winds at pedestrian level at Logan Airport are in Category 2, uncomfortable for walking, and are just under the Boston 31 mph effective gust wind speed guideline (converted to an average wind). Therefore, most people would perceive conditions in the open at Logan Airport as uncomfortable for walking.

The following discussion provides Melbourne categories for specific wind directions. Overall, categories for all wind directions would be equal to or less than the greatest of these.

* Melbourne, W.H., "Criteria for Environmental Wind Conditions," *Journal of Industrial Aerodynamics*, Vol. 3, 1978, pp. 241-249.



* Melbourne's Category

1 Unacceptable and dangerous
2 Uncomfortable for walking
3 Acceptable for walking
4 Acceptable for short periods of standing or sitting
5 Acceptable for long periods of standing or sitting

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FIGURE IV.1-10
MELBOURNE'S CRITERIA FOR PEDESTRIAN LEVEL WINDS

Wind speeds on top of a 225-foot hill without any shelter (a bare hilltop) would probably be well above the BRA guideline wind speed. However, the buildings and trees on the sides and top of the hill, at the Project site, tend to reduce such wind speeds.

1.5 Pedestrian Level Winds at the Site

1.5.1 Introduction

In the following sections, the effects of northwest winter winds, southwest summer winds, and easterly storm winds will be discussed for existing and build conditions.

For the most part the weather in New England is dominated by either large coastal storms (fall, winter, and spring) or the Bermuda High (summer). Typically, when a coastal storm occurs, it rains or snows for 4 to 12 hours, then it clears, and, as the storm moves to the northeast, the winds blow from the northwest for three or four days until the next weather system arrives. These storms and the northwest winds following them, occur mostly in the fall, winter, and spring. Northwest winds are particularly uncomfortable in the winter, when typically they occur on cold days. The Bermuda High is generally responsible for the southwest winds that occur in the summer.

1.5.2 Northwest (Winter) Winds (Figures IV.1-11 and IV.1-12)

1.5.2.1 Introduction

Northwest winds blow across Parker Hill Avenue as shown in Figure IV.1-11 and IV.1-12. Thus the Fogg Building provides sheltering for Parking Lot G. Parking Lot F is upstream of the northeast end of the site so the only sheltering for that portion of the site is due to the trees upstream and near the top of the hill. Northwest winds, when they are strong, can be very uncomfortable on a cold wintry day.

1.5.2.2 Northwest Winds for Existing Conditions (Figure IV.1-11)

From the above, it is clear that some of the site is very exposed to northwest winds and is quite windy when the wind comes from the northwest (probably high Category 3). Parking Lot G is sheltered by the Fogg Building (low Category 3). The main entrance to the hospital is completely sheltered by the Brigham and Jenks Buildings (Category 5). However, it is probably windy getting there from Parking Lot G (low Category 3).

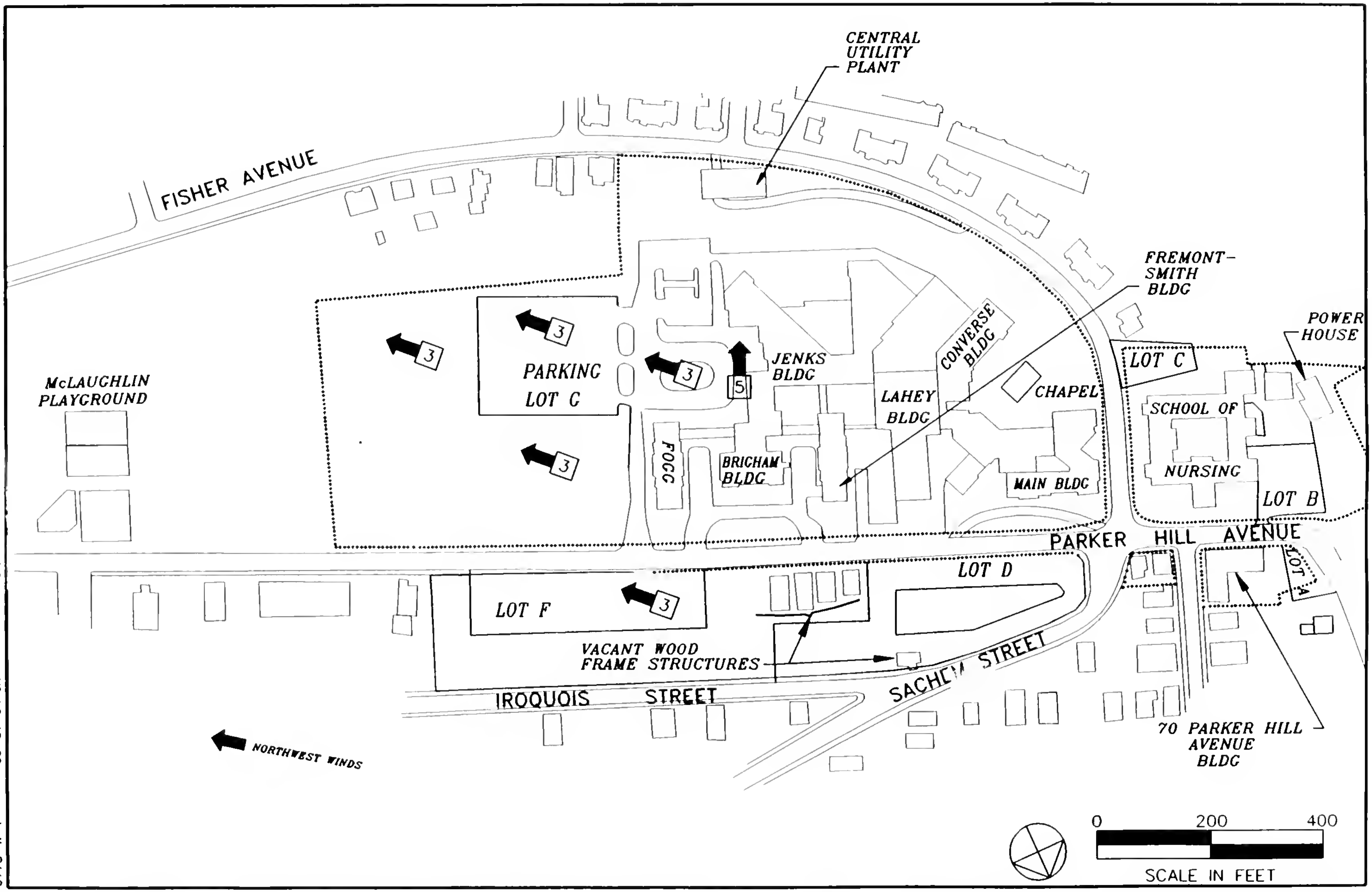

FIGURE IV.1-11
MELBOURNE CATEGORIES FOR EXISTING CONDITIONS FOR NORTHWEST WINDS
NEW ENGLAND BAPTIST HOSPITAL

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1.5.2.3 *Northwest Winds for Build Conditions (Figure IV.1-12)*

The Ambulatory Care Building will have little or no effect on PLWs along Fisher Avenue, and Sachem and Iroquois Streets coming from the northwest. Sachem and Iroquois Streets are upwind for northwest winds and therefore will be unaffected by construction of the Project. The two proposed buildings will slow down the winds downwind of the site, but may increase the turbulence slightly.

For build conditions, the winds at the existing main entrance to the Hospital will be unchanged (Category 5). The patient and visitor entrance in the middle of the passageway between the Fogg Building and the Ambulatory Care Building will be sheltered by the Fogg Building and the passageway (Category 4). The patient and visitor entrance at the east end of the passageway will be sheltered (Category 5). On the other hand it may be a little windy in the drop-off area for that entrance (Category 4). Also, the path between the exit at the northwest corner of the new Parking Structure and the patient and visitor entrance in the middle of the passageway between the Fogg Building and the Ambulatory Care Building will be windy (Low Category 3 or high 4).

The employee entrance at the southwest corner of the west wing of the Ambulatory Care Building just north of the passageway and the path to it from Parking Lot F will be a little windier than under current conditions (mid to high Category 3). The other employee entrance at the southwest corner of the east wing of the Ambulatory Care Building will be sheltered (Category 5).

Northwest winds will be accelerated around the northeast corner of the Ambulatory Care Building, but the effect will not extend as far as the new main vehicular entrance. Thus the proposed open space to the east of that entrance will be unaffected.

1.5.3 *Southwest (Summer) Winds (Figures IV.1-13 and IV.1-14)*

1.5.3.1 *Introduction*

The prevailing winds in the summer are from the southwest. Southwest winds approach the site diagonally and are perpendicular to the southwest-facing facade of the Jenks Building. It should be borne in mind that, on hot summer days, some windiness may be desirable.

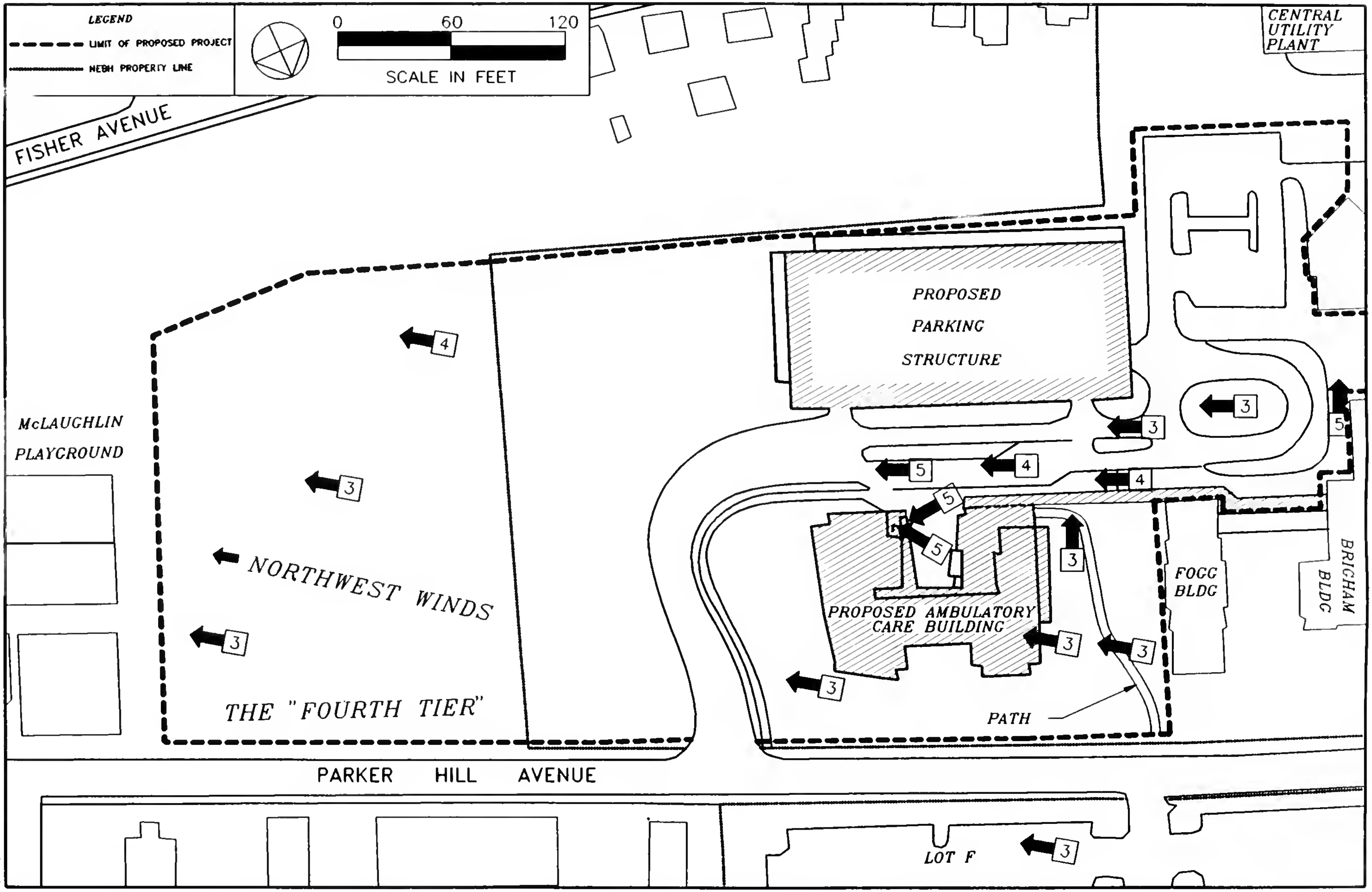

FIGURE IV.1-12
MELBOURNE CATEGORIES FOR BUILD CONDITIONS FOR NORTHWEST WINDS
NEW ENGLAND BAPTIST HOSPITAL

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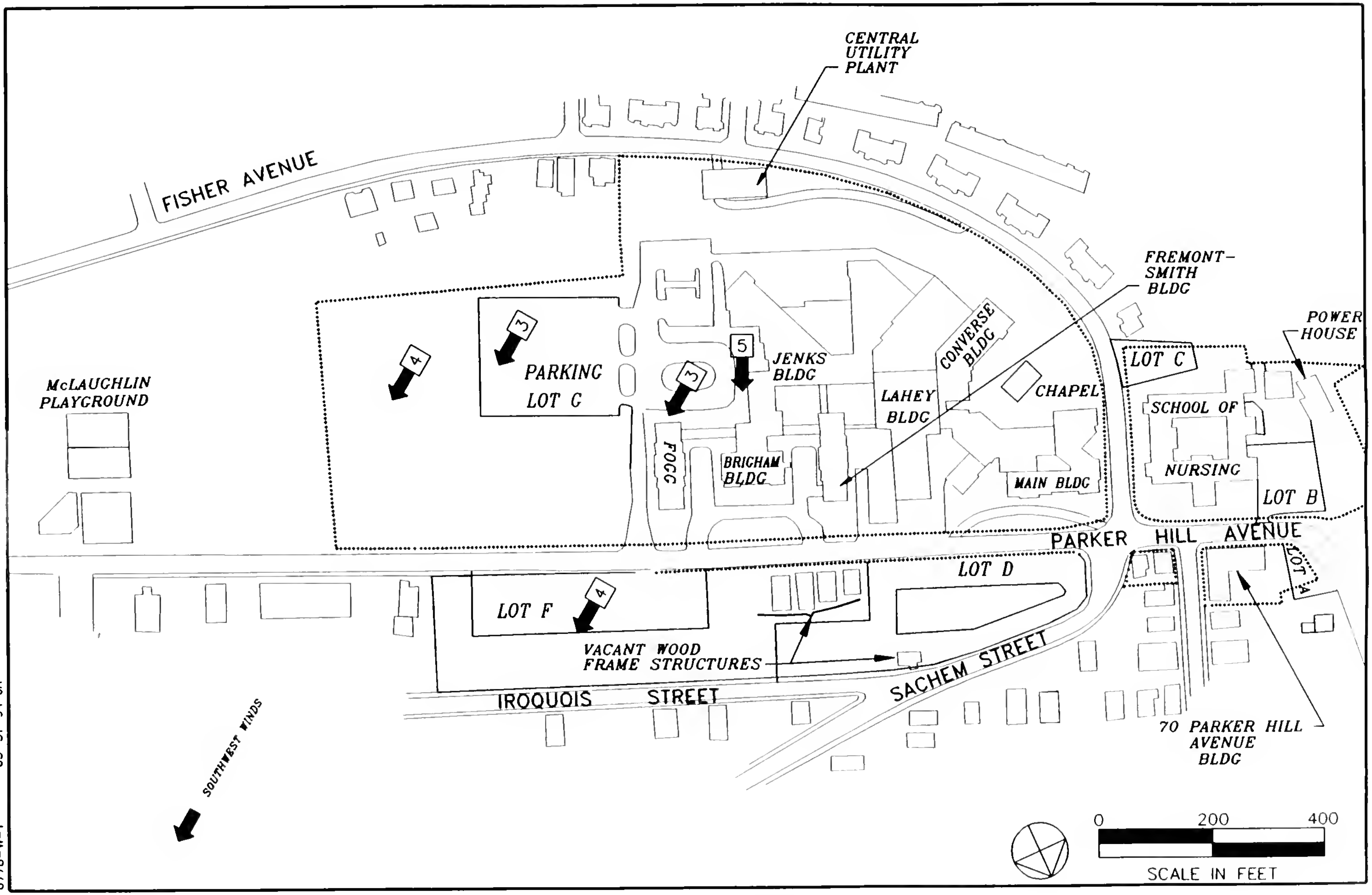

FIGURE IV.1-13
MELBOURNE CATEGORIES FOR EXISTING CONDITIONS FOR SOUTHWEST WINDS
NEW ENGLAND BAPTIST HOSPITAL

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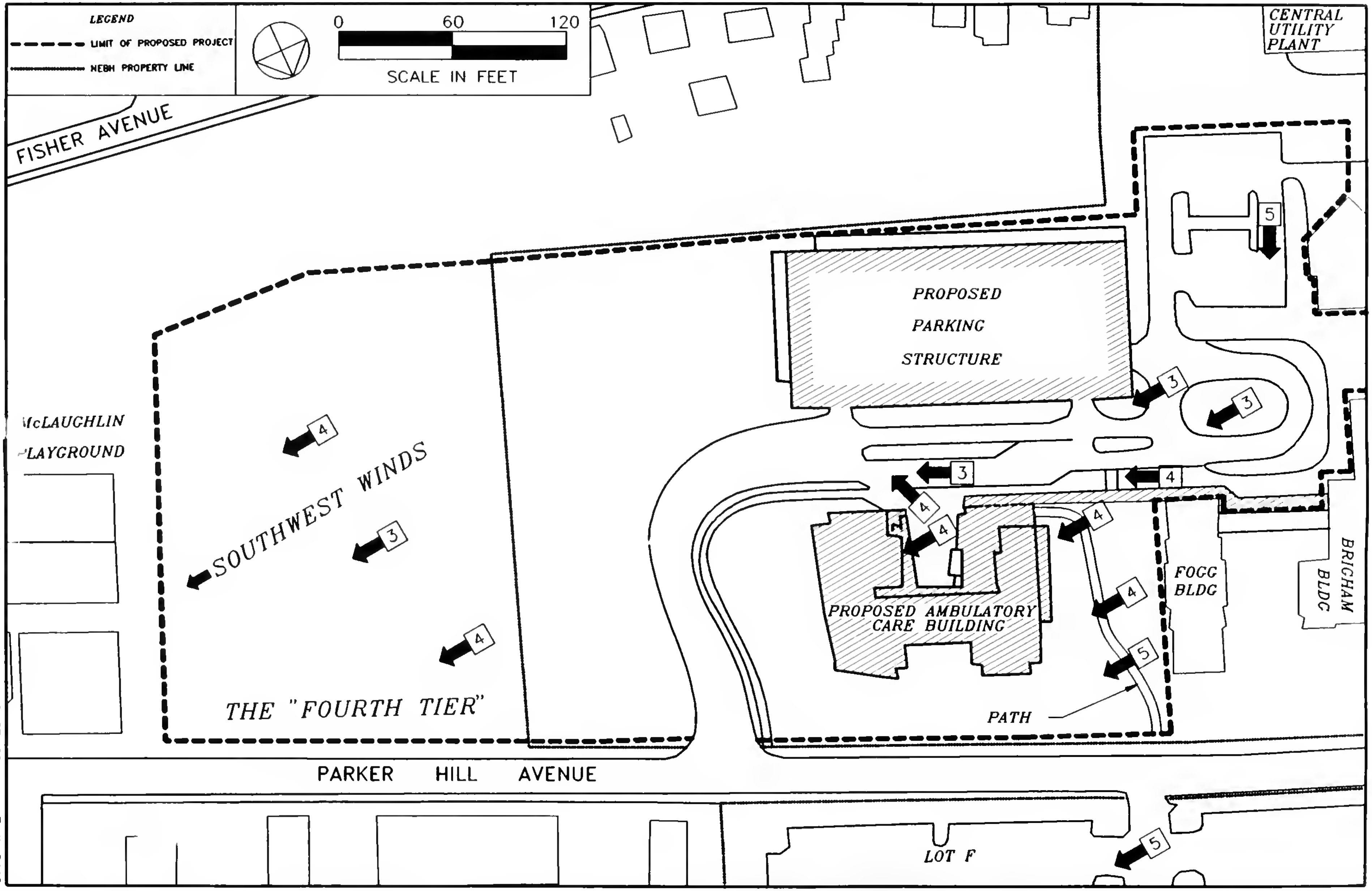

FIGURE IV.1-14
MELBOURNE CATEGORIES FOR BUILD CONDITIONS FOR SOUTHWEST WINDS
NEW ENGLAND BAPTIST HOSPITAL

1.5.3.2 Existing Conditions in Southwest Winds (Figure IV.1-13)

The VA Hospital, which includes some 10- to 15-story buildings, is below Parker Hill to the west-southwest of the site. These buildings are far enough away from the site that their main effect at the site is to slow the wind down and increase its turbulence.

The main entrance to the Hospital is in the lee of both the Jenks and Brigham Buildings and thus is sheltered from southwest winds (Category 5). However, Parking Lot G is very exposed to southwest winds and despite the presence of some trees, is noticeably windy (high Category 4 or low 3). Without those trees the parking lot would be much windier, especially in the summer. Because there are only a few trees upwind of the area between the parking lot and the drop off to the main entrance to the Hospital, that area is quite windy (low Category 3). Currently, trees protect the whole east end of the top of the hill from southeast winds.

1.5.3.3 Build Conditions for Southwest Winds (Figure IV.1-14)

Even though the Parking Structure is only two or three stories, it will tend to slow southwest winds in the open area just to the east of the Ambulatory Care Building. Wind speeds in the rest of the open area to the east will be unchanged. As with northwest winds, the two new buildings will have negligible effect on winds along Fisher Avenue or Sachem and Iroquois Streets.

PLWs at the main entrance to the Hospital due to southwest winds will be unchanged and stay in Category 5. PLWs in the drop-off area in front of the main entrance will also be slightly increased due to the presence of the Parking Structure (Category 3). Winds in Parking Lot F and in a portion of the pathway from there to the employee entrance in the west wing of the Ambulatory Care Building just north of the passageway will be light (Category 5) because that area is in the lee of the passageway, or the Fogg and Jenks Buildings. The rest of the pathway and the entrance will have winds in Category 4. The other employee entrance at the southwest corner of the east wing of the Ambulatory Care Building will be moderately windy (high Category 4).

The entrance to the hallway along the passageway between the Fogg and Ambulatory Care Building will also be somewhat windy as currently designed (high Category 4). It could be made less windy at the entrance by putting a doorway on either side instead of at the front (low Category 4). The walkway between that entrance and the Parking Structure exit will have winds in high Category 4 or low 3. The Parking Structure exit will not be windy (Category

5), but there will be Category 3 winds across the walkway to the passageway entrance.

PLWs at the main entrance to the Ambulatory Care Building at the southeast corner of the west wing will be modest (high Category 4); they will be in low Category 3 at the car drop-off sidewalk in front of that entrance.

1.5.4 Easterly Storm Winds (Figures IV.1-15 to IV.1-20)

1.5.4.1 Introduction

Easterly winds occur about one third of the time. Light easterly winds occur as a storm starts or in the summer as a sea breeze. During the first 4-12 hours of a typical coastal storm, it rains or snows depending on the temperature, and the wind is from the northeast or southeast depending on whether the center of the storm passes to the east or west of the city.

Since it will generally be raining or snowing during strong easterly winds, and people expect it to be windy, the emphasis in the following discussions will be on entering or exiting the various buildings. Also, because easterly winds cover such a wide range of wind directions, the discussion will cover northeast, east, and southeast winds separately in that order. However, wind from each of these directions occurs only one-third as often as wind from the northwest and southwest directions.

1.5.4.2 Storm Winds for Existing Conditions (Figures IV.1-15, IV.1-17 and IV.1-19)

A. Northeast Winds for Existing Conditions (Figure IV.1-15)

Northeast winds blow the opposite direction from the southwest winds just discussed. The open area to the east of the site including Parking Lot G is quite windy (Category 3), but would be even windier without the many trees in and surrounding the area.

The main entrance to the Hospital is shielded from these winds by the Fogg Building and the connecting link between the Fogg and Brigham Buildings (Category 5), but the main drop-off area is not sheltered and is quite windy (Category 3). Parking Lot F and the walkway from it to the Hospital are also windy (Category 3).

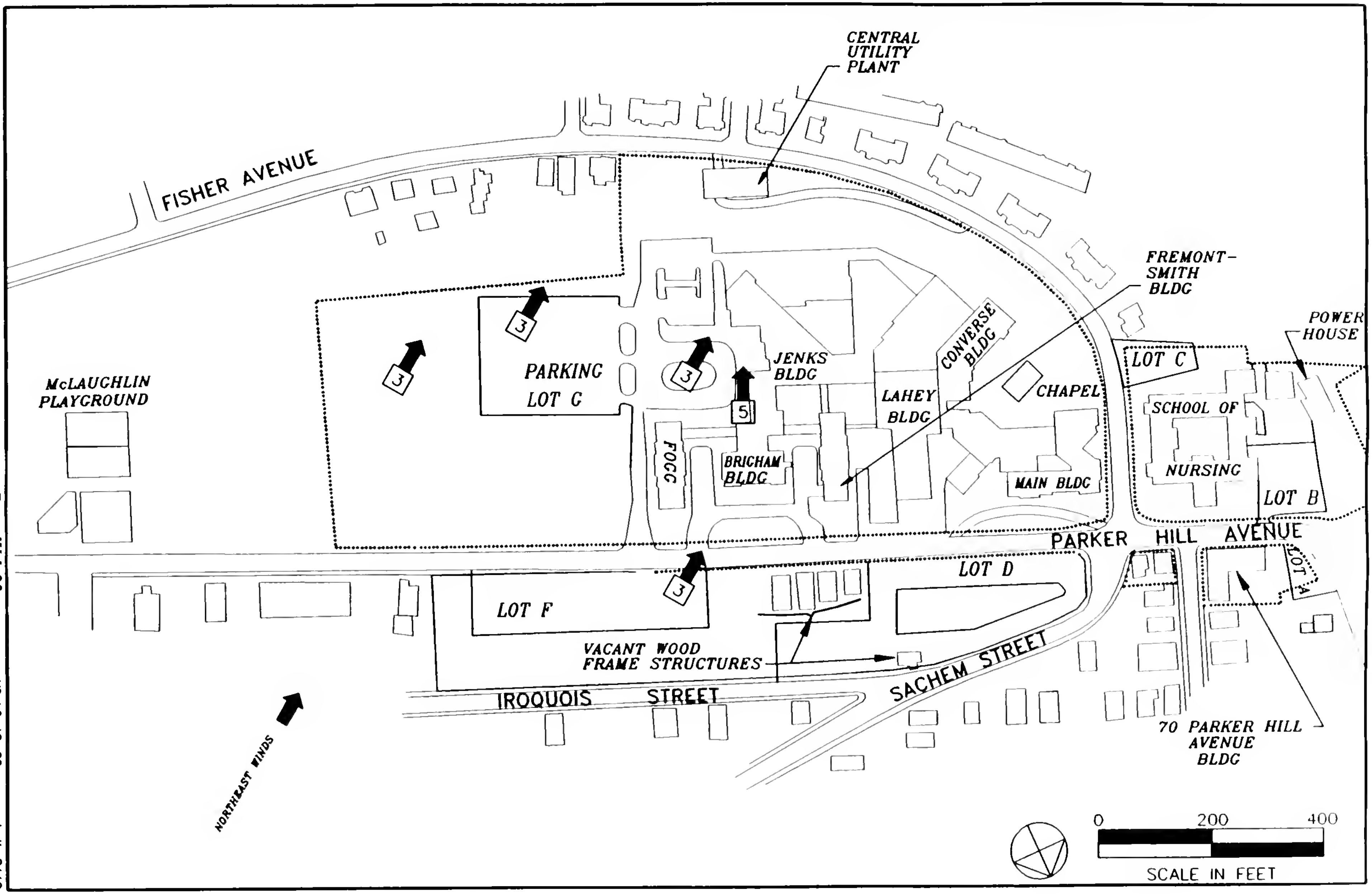

FIGURE IV.1-15
MELBOURNE CATEGORIES FOR EXISTING CONDITIONS FOR NORTHEAST WINDS
NEW ENGLAND BAPTIST HOSPITAL

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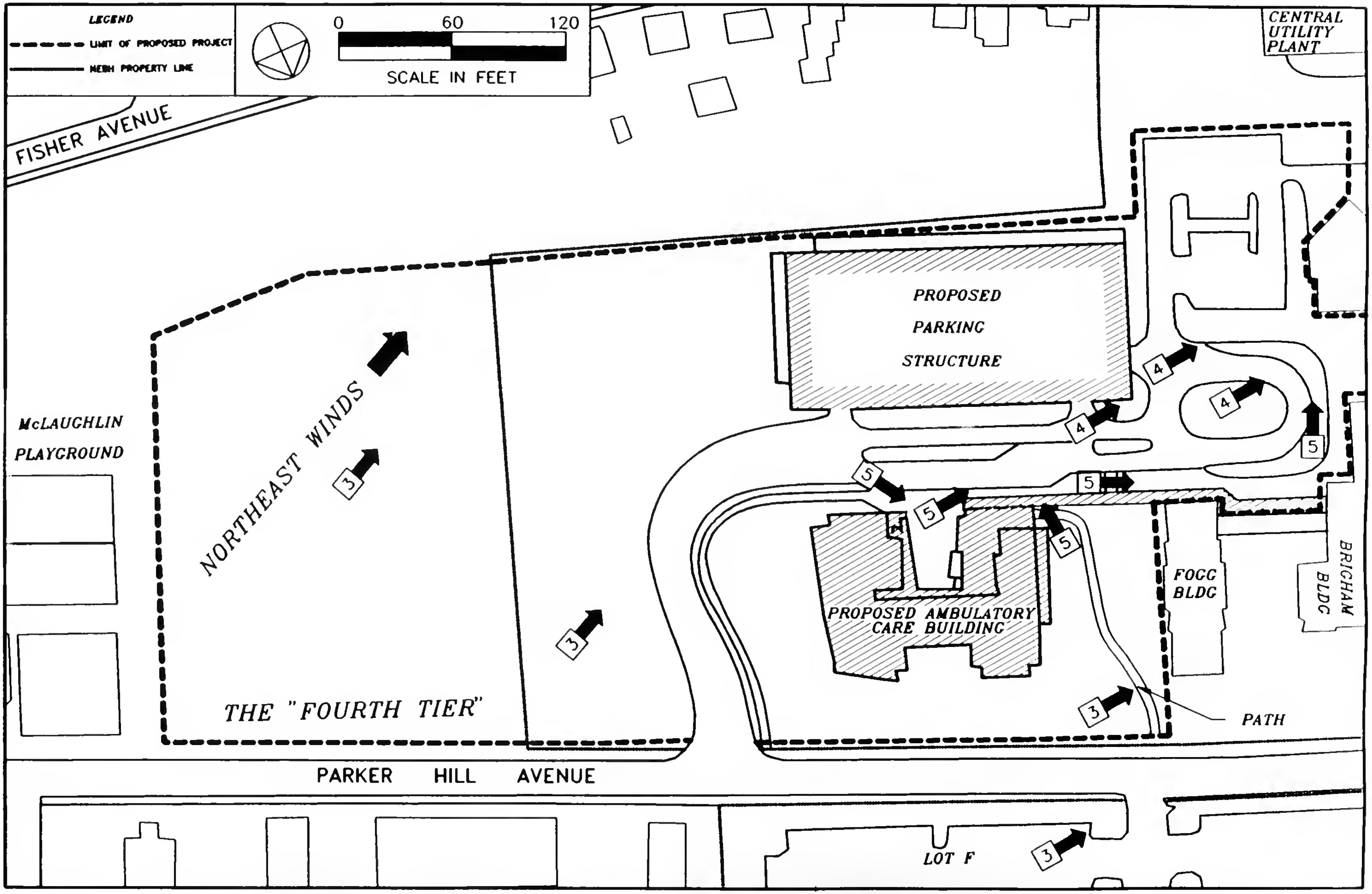

FIGURE IV.1-16
MELBOURNE CATEGORIES FOR BUILD CONDITIONS FOR NORTHEAST WINDS
NEW ENGLAND BAPTIST HOSPITAL

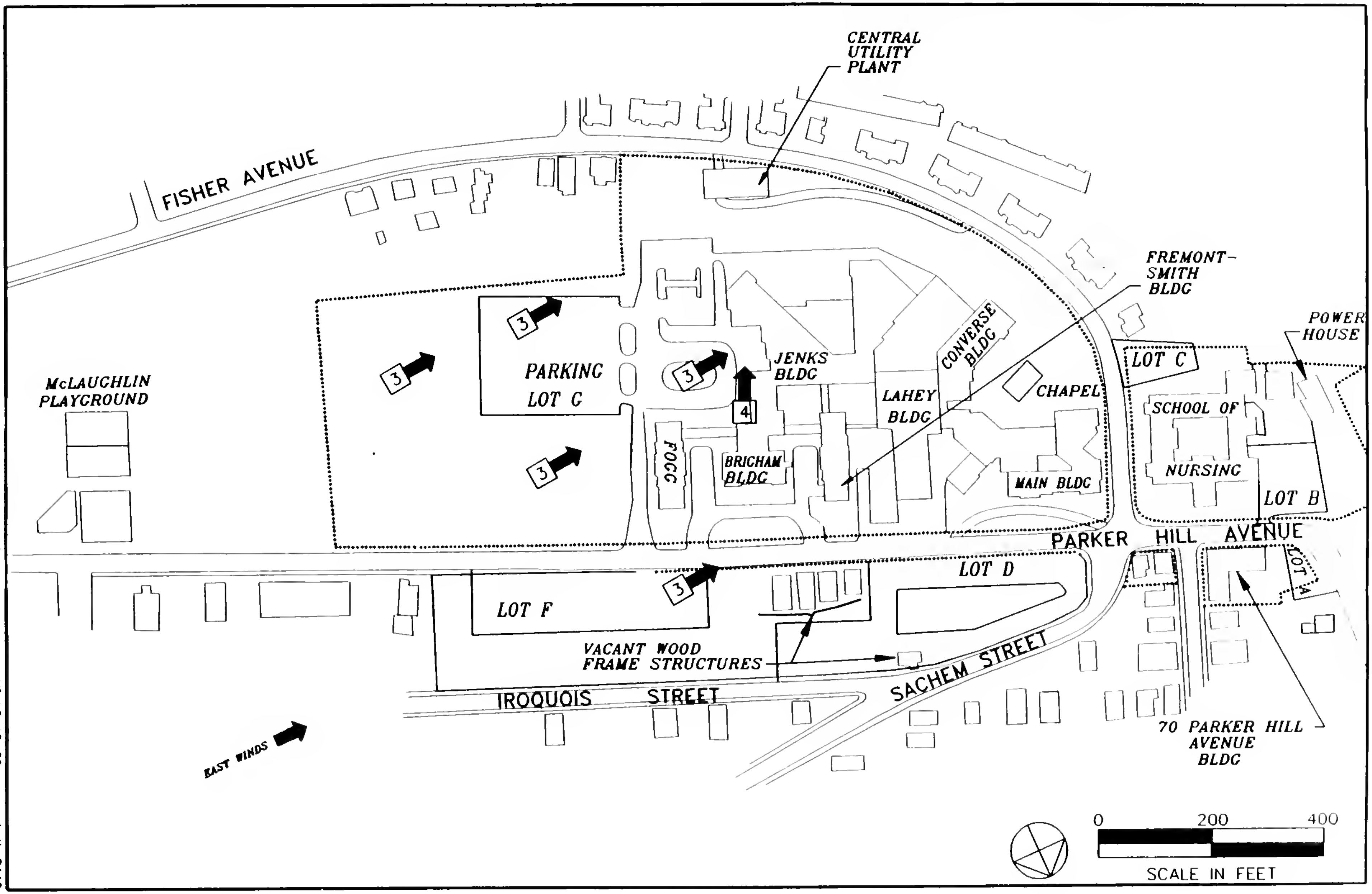

FIGURE IV.1-17
MELBOURNE CATEGORIES FOR EXISTING CONDITIONS FOR EAST WINDS
NEW ENGLAND BAPTIST HOSPITAL

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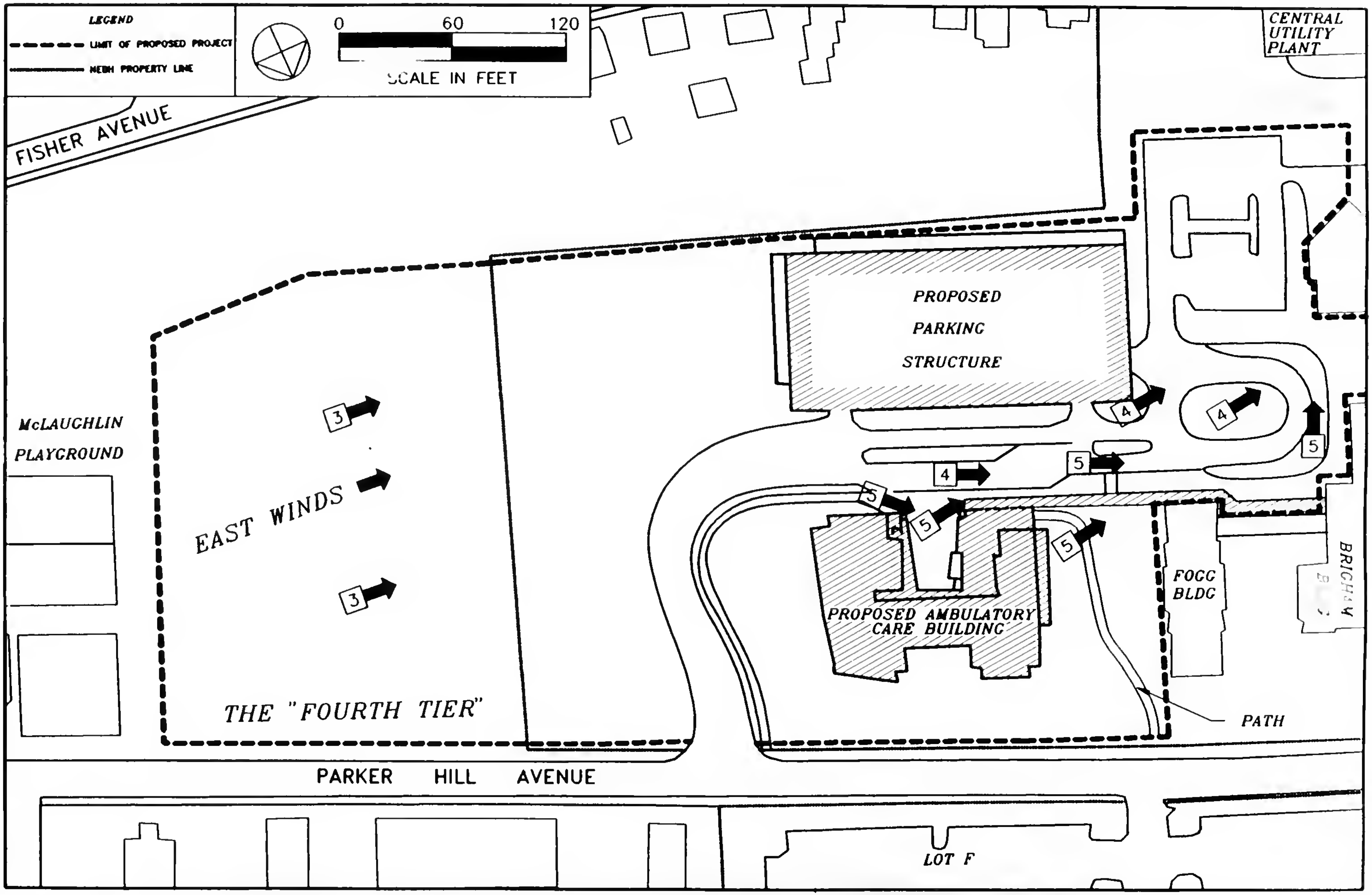

FIGURE IV.1-18
MELBOURNE CATEGORIES FOR BUILD CONDITIONS FOR EAST WINDS
NEW ENGLAND BAPTIST HOSPITAL

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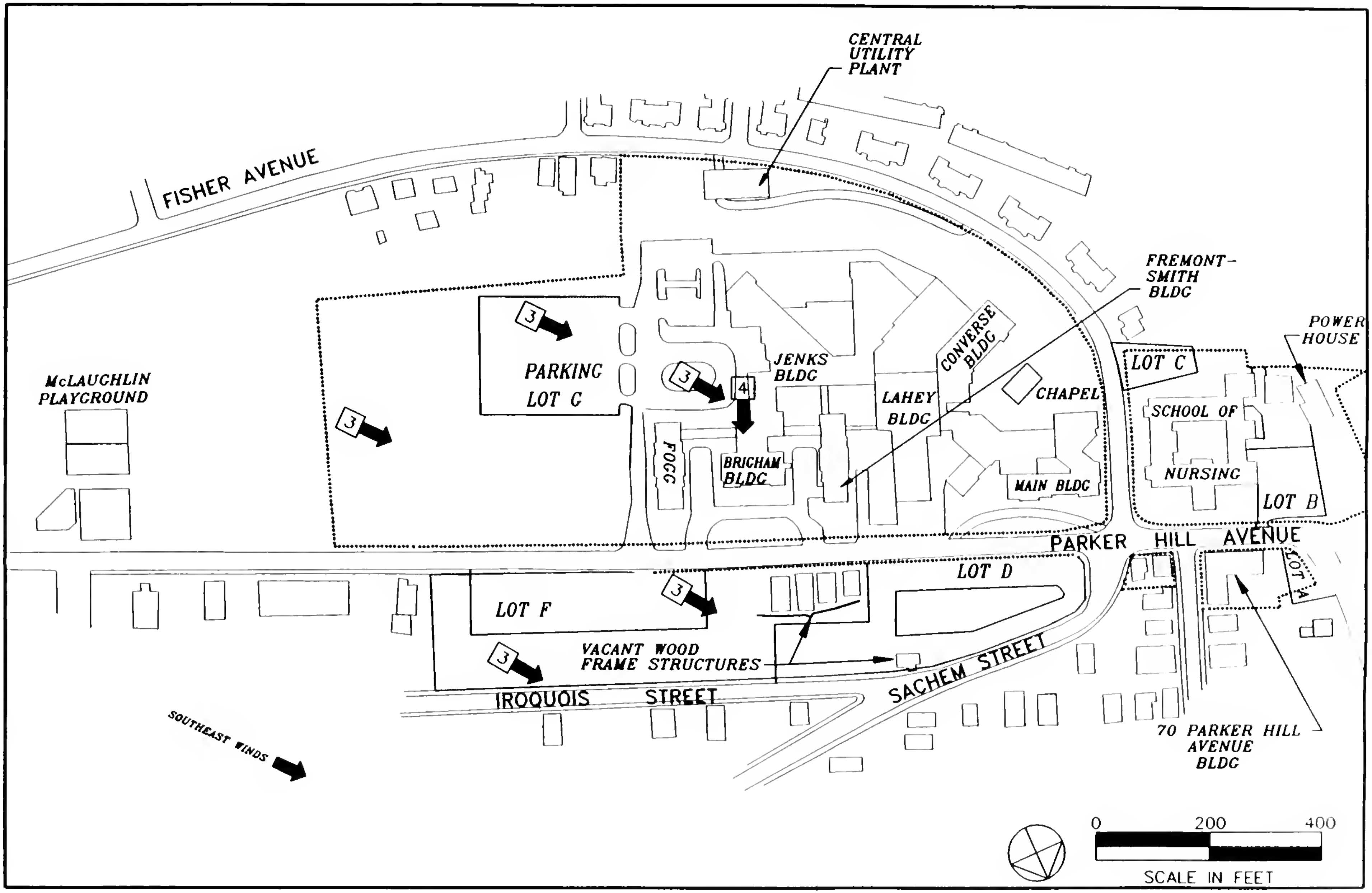

FIGURE IV.1-19
MELBOURNE CATEGORIES FOR EXISTING CONDITIONS FOR SOUTHEAST WINDS
NEW ENGLAND BAPTIST HOSPITAL

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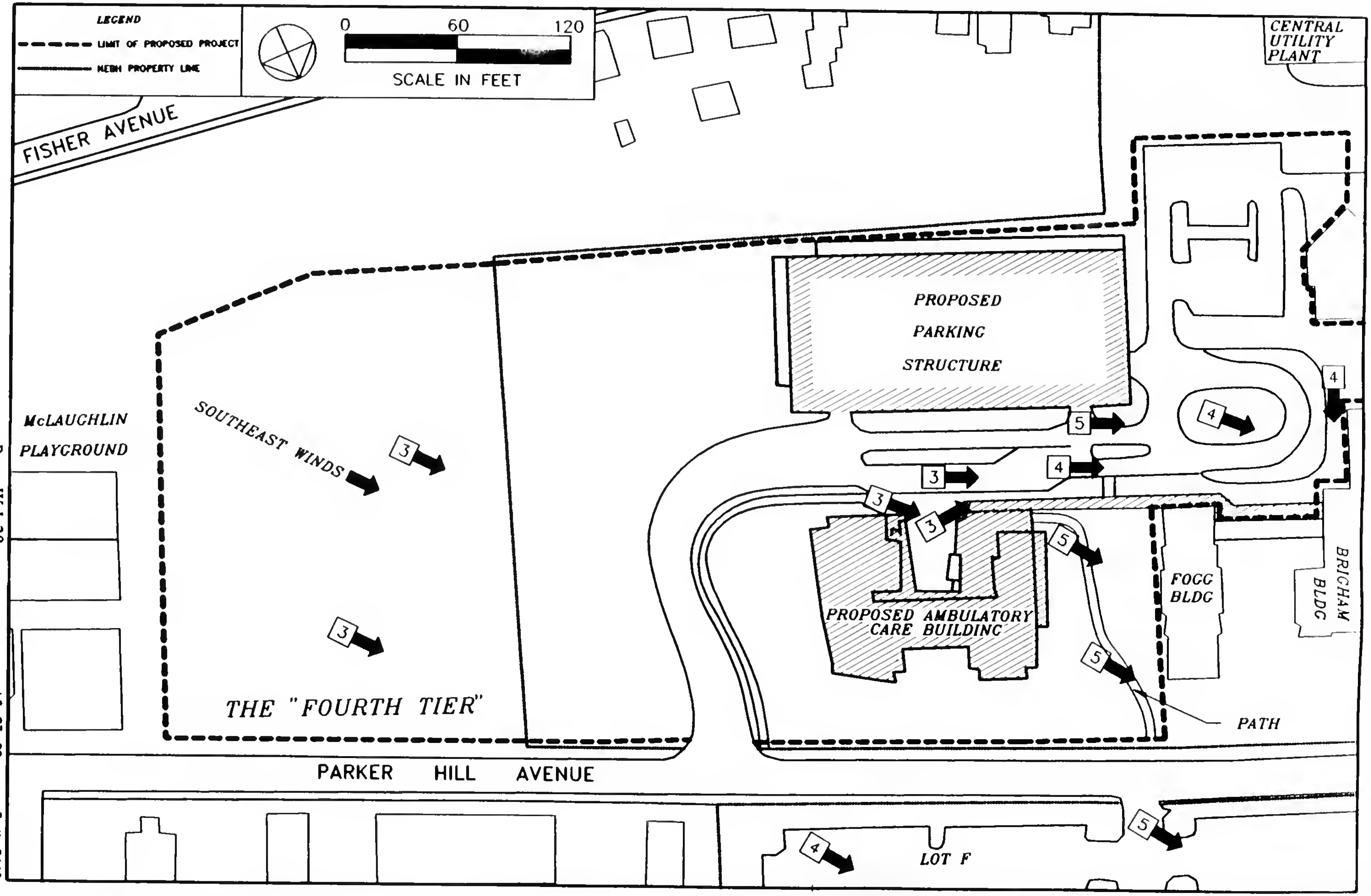

FIGURE IV.1-20
MELBOURNE CATEGORIES FOR BUILD CONDITIONS FOR SOUTHEAST WINDS
NEW ENGLAND BAPTIST HOSPITAL

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B. East Winds for Existing Conditions (Figure IV.1-17)

Currently, the main entrance to the Hospital is only partially protected from east winds by the Fogg Building and is probably quite windy (high Category 4). The drop-off area in front of the main entrance and Parking Lots F and G are quite windy (high Category 3). The whole open area at the east end of the hill is also windy (Category 3) except near those spots sheltered by dense trees.

C. Southeast Winds for Existing Conditions (Figure IV.1-19)

For southeast winds the existing buildings offer little sheltering for the main entrance to the Hospital (Category 4). Nor is there any sheltering for Parking Lot G or the drop-off area in front of the main entrance (Category 3). However, Parking Lot F will have some sheltering from the hill (high Category 4 or low 3). Again, the whole open area at the east end of the hill is windy (Category 3) except near those spots sheltered by dense trees.

1.5.4.3 Storm Winds for Build Conditions (Figures IV.1-16, IV.1-18, and IV.1-20)

A. Northeast Winds for Build Conditions (Figure IV.1-16)

For the Build condition for northeast winds, the open area to the east of the site will remain quite windy (Category 3), but would be even windier without the many trees in and surrounding the area. The new buildings will have no effect on northeast winds along Sachem and Iroquois Streets or along Fisher Avenue.

The main entrance to the Hospital will remain shielded from these winds by the Fogg Building and the connecting link between the Fogg and Brigham Buildings (Category 5). The Ambulatory Care Building and the connecting link to the Fogg Building will provide additional sheltering for the main drop-off area (Category 4). Parking Lot F and the pathway from it to the west wing of the Ambulatory Care Building will remain windy (Category 3), but the actual entrance and the pathway near it will be sheltered by the Ambulatory Care Building (Category 4 or 5).

The entrances to the Ambulatory Care Building at the southeast corner of the west wing and at southwest corner of the east wing as well as the drop-off area for the southeast entrance will be in the lee of the Building and not windy (Category 5). The entrance in the middle of the

connecting link between the Ambulatory Care Building and the Fogg Building as well as the exit from the Parking Structure and the walkway between them will also be sheltered by the Ambulatory Care Building (Category 5 or low 4).

B. East Winds for Build Conditions (Figure IV.1-18)

For the Build condition for east winds, the open area to the east of the site will not be affected by the two new buildings. The east winds along Sachem and Iroquois Streets or along Fisher Avenue will also be unaffected.

For east winds, the Ambulatory Care Building will provide additional sheltering for the main entrance (Category 5) and the drop-off area in front of it (Category 4).

In fact, all the entrances to the Ambulatory Care Building that are exposed to winds will be in the lee of that building (Category 5). Even the drop-off area in the front of the entrance at the southeast corner of the west wing of the Ambulatory Care Building and the exit from the Parking Structure will be sheltered by the Ambulatory Care Building (Category 5 or low 4).

C. Southeast Winds for Build Conditions (Figure IV.1-20)

Under the Build condition for southeast winds, the whole open area at the east end of the site will be unaffected and remain windy (Category 3) except near those spots sheltered by dense trees. Winds along Sachem and Iroquois Streets and along Fisher Avenue will not be affected by the new buildings.

For southeast winds, the Parking Structure will provide some sheltering for the main entrance to the Hospital and the drop-off area in front of it (Category 4). The exit from west end of Parking Lot F and the path from there to the employee entrance in the Ambulatory Care Building at the southwest corner of the west wing will all be sheltered by the Ambulatory Care Building (Category 4 or 5). The east end of Parking Lot F will not be sheltered and winds there will remain in Category 4.

The employee entrance at the southwest corner of the east wing of the Ambulatory Care Building will be windy (Category 3). The patient and visitor entrance at the southeast corner of the east wing will also be windy (low Category 3), as will the drop-off area in front of it (Category 3).

The exit from the Parking Structure and the entrance in the middle of the enclosed walkway between the Fogg and Ambulatory Care Buildings will be in the lee of the Parking Structure and will not be windy (Category 4 or 5).

1.6 Conclusions

Currently, no location in or near the Project site is believed to exceed the BRA Guideline wind speed, nor is any location believed to have winds lower than Melbourne's Category 3. The net effect of the addition of the two structures is to have no effect or to reduce the winds at the locations considered. The two new structures will have no effect on winds along Sachem and Iroquois Streets or along Fisher Avenue.

This assessment has been made assuming the existence of only the existing trees on the site. The addition of the proposed landscaping should further reduce any windiness, and will be especially effective on mitigating winds in the Hospital's meadow to the east of the proposed buildings.

If the entrance into the middle of the south side of the link between the Fogg Building and the new building were changed so that there was one doorway on each side of the entry hall, wind conditions there would be improved. The Hospital's architect will evaluate this option for the Final Project Impact Report.

1.7 References

1) Davenport, A.G., and Isyumov, N., "The Application of the Boundary Layer Wind Tunnel to the Prediction of Wind Loading," Proceedings of International Seminar on Wind Effects on Buildings and Structures, Ottawa, Canada, September 1967.

2) Melbourne, W.H., "Criteria for Environmental Wind Conditions," *Journal of Industrial Aerodynamics*, Vol. 3, 1978, pp. 241-249.

2.0 AIR QUALITY ANALYSIS

An analysis was conducted to evaluate air quality impacts of the proposed Ambulatory Care Building and Parking Structure. This study provides a microscale analysis of motor vehicle emissions from project area roadways and the Project's proposed parking facilities. The microscale analysis is designed to evaluate concentrations of carbon monoxide (CO) at sensitive locations for comparison to State and Federal standards. The study is described below.

2.1 Microscale Analysis

The microscale analysis was conducted to evaluate the effect of project area traffic on CO concentrations at sensitive receptors, both with and without construction of the Project. Since CO emissions from motor vehicles are greatest during the idling, acceleration and deceleration operating modes, sensitive receptors are typically located in close proximity to project area intersections operating at the poorest level-of-service (LOS).

CO is used in microscale studies to indicate roadway pollutant levels since it is the most abundant pollutant emitted by motor vehicles and can result in, so called, "hot spot" (high concentration) locations around congested intersections. National Ambient Air Quality Standards (NAAQS) have been established for CO to protect the public health (known as primary standards). These standards do not allow ambient CO concentrations to exceed 35 parts per million (ppm) for a one-hour averaging period and 9 ppm for an eight-hour averaging period, more than once per year at any location. Air quality modeling techniques (computer simulation programs) are used to predict CO levels for both existing and future conditions.

The objective of the microscale analysis was to show compliance with National Ambient Air Quality Standards established for CO with construction of the Project. This involves a demonstration that the Project will not cause an exceedance of a standard at locations attaining standards, as well as a demonstration that the Project will not degrade air quality levels at locations where existing air quality exceed CO standards, if any such locations were predicted to occur.

2.1.1 Intersections/Sensitive Receptors Modeled

Intersections for the microscale analysis were selected in consultation with the Boston Redevelopment Authority (BRA)* and Massachusetts Department of Environmental Protection (DEP).** The following intersections were studied:

- Huntington Avenue/South Huntington Avenue
- South Huntington Avenue/Heath Street

Huntington Avenue at South Huntington Avenue is a signalized intersection, while the intersection of South Huntington Avenue at Heath Street is controlled by a "Yield" sign on Heath Street.

Sensitive receptors were located around the two study intersections, based on field investigations, to evaluate CO levels. Consistent with EPA Guidelines, these were situated where maximum ambient CO concentrations are likely to occur (i.e., near intersection vehicle queues) and where the general public is likely to have access. Figures IV.2-1 and IV.2-2 show the sensitive receptor locations in relation to modeled intersection geometry.

2.1.2 Modeling Methodology

CO concentrations were predicted at sensitive receptor locations for both existing and future conditions. The cases evaluated included the following:

Case	Year	Project Status
1	1994	Existing
2	1998	No Build
3	1998	Build

For each case modeled, the EPA MOBILE5a*** and CAL3QHC**** (Version 2) computer programs were used to calculate motor vehicle emissions and CO concentrations at sensitive receptors using peak one-hour traffic data. Emissions data calculated by the MOBILE5a model were based on motor vehicle operating characteristics. In addition, the Commonwealth's statewide annual Inspection and Maintenance (I&M) program was included.

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* Personal Communication, Mr. Richard Mertens, BRA, March 17 and 22, 1994.

** Personal Communication, Mr. Keith Grillo, Massachusetts DEP, Division of Air Quality Control, March 17 and 22, 1994.

*** EPA, *User's Guide to MOBILE5a (Mobile Source Emissions Factor Model)*, March, 1993.

**** EPA, *User's Guide to CAL3QHC Version 2.0: A Modeling Methodology For Predicting Pollutant Concentrations Near Roadway Intersections*, EPA-454-92-006, November, 1992.

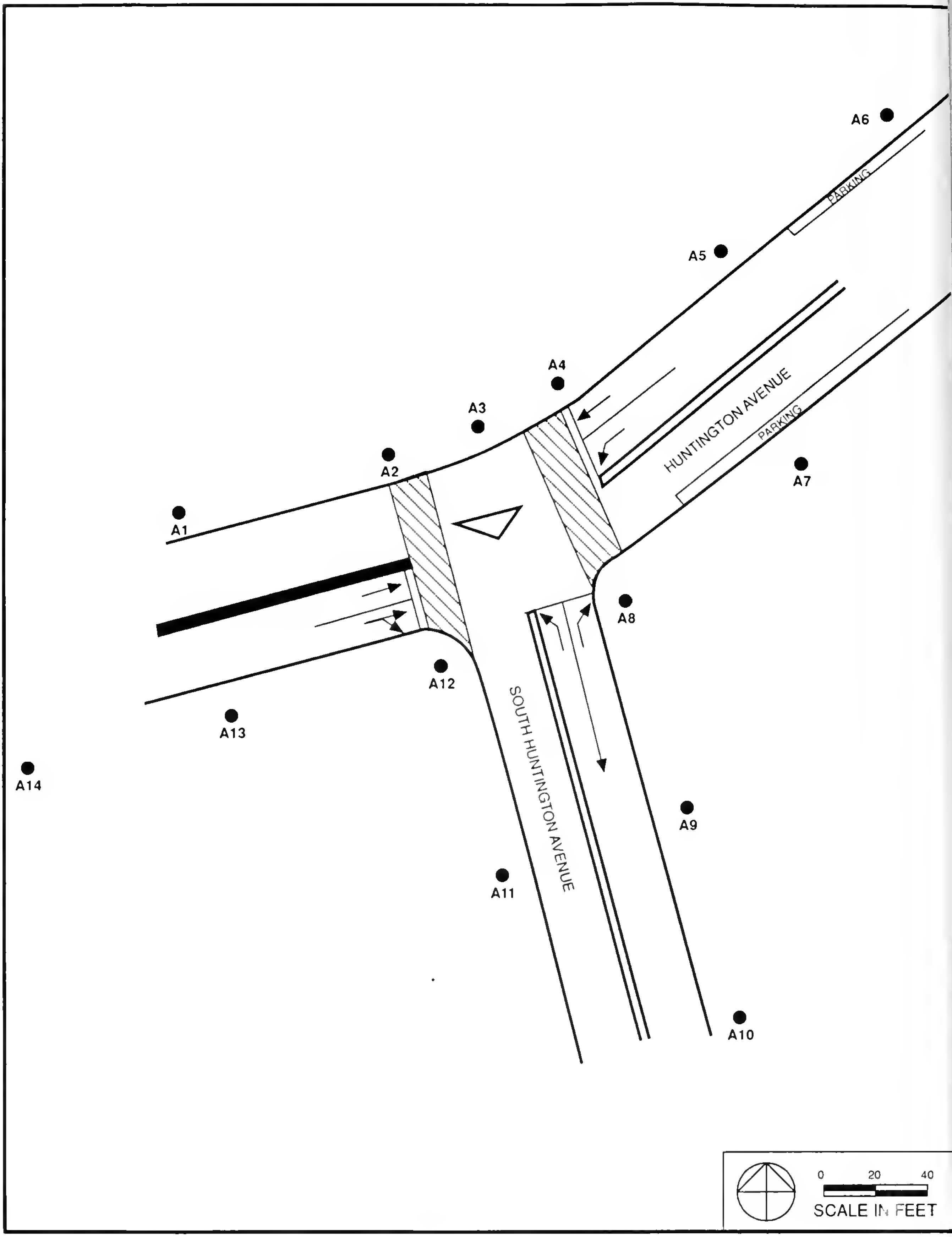

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FIGURE IV.2-1

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HUNTINGTON AVENUE/SOUTH HUNTINGTON AVENUE

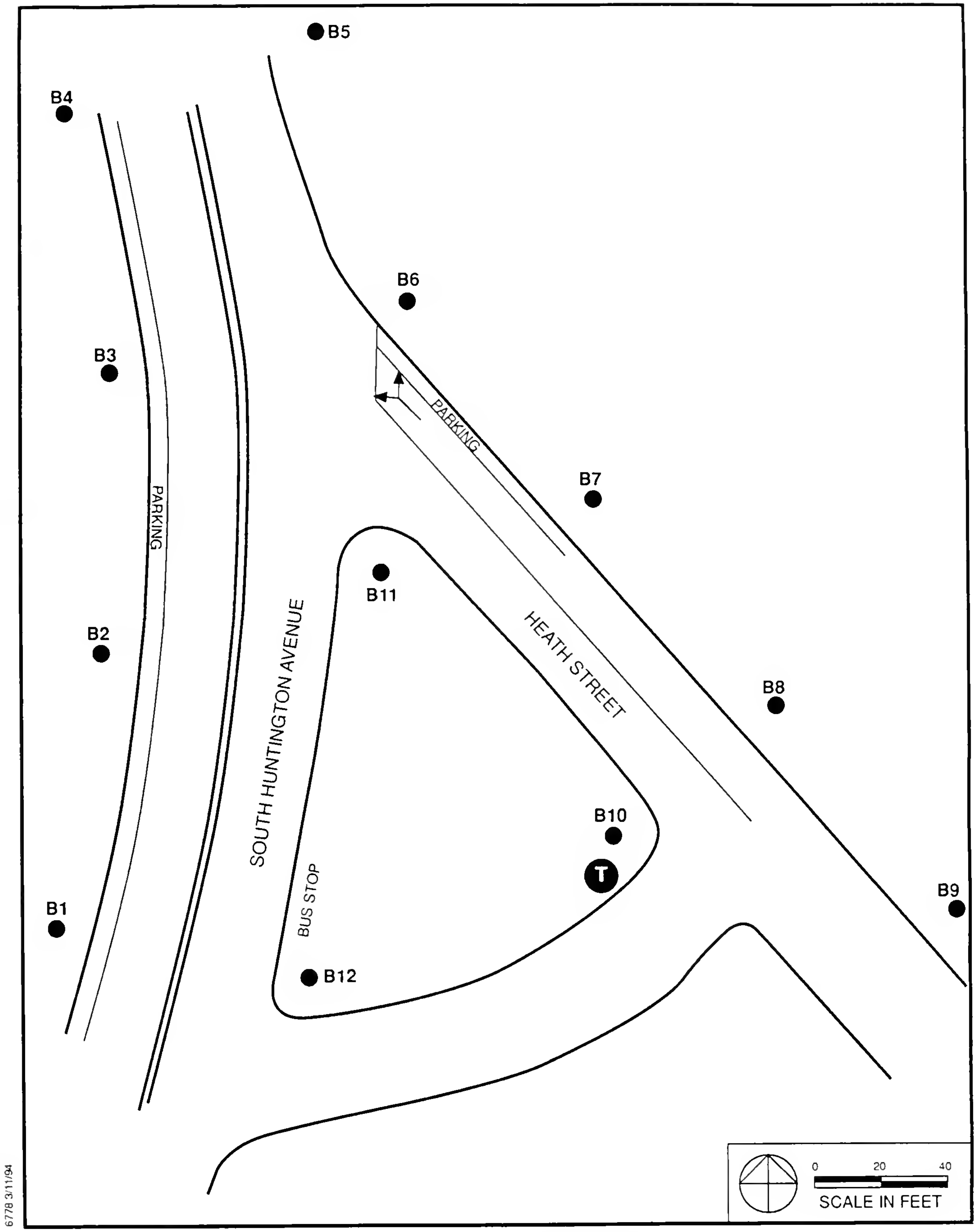

FIGURE IV.2-2

SOUTH HUNTINGTON AVENUE/HEATH STREET

Peak one-hour traffic volumes and turning movements based on the traffic component of this DPIR were used in the analysis. These data were used to assess one-hour CO concentrations. For the peak eight-hour period, roadway concentrations were calculated using an eight-hour to one-hour ratio (or persistence factor) of 0.70 as recommended by EPA. This persistence factor accounts for the variability in meteorology over an eight-hour period as compared to one-hour conditions. Eight-hour concentrations were calculated by multiplying predicted one-hour levels by this persistence factor.

Air quality effects associated with the Project's proposed open Parking Structure and surface lot were also considered in the study. Using EPA MOBILE5a computer model emissions for vehicles in the Parking Structure and on the surface lot, traffic flow design, and traffic volumes, the CAL3QHC dispersion model was used to determine downwind CO concentrations. These results were then combined with roadway effects at the sensitive receptors around the closest intersection of South Huntington Avenue and Heath Street. Also, a number of additional receptors were located in the immediate vicinity of the parking facilities. These additional receptors are shown in Figure IV.2-3.

An air quality analysis also requires an estimate of "background" air quality levels, representing the contribution of all sources in the project area less the specific intersections and the proposed parking facilities analyzed. Background levels of 5.0 ppm for the peak one-hour and 3.0 ppm for the peak eight-hour were used for the existing year 1994. For the future year (1998), background levels were scaled from 1994 to 1998 based on increases in background traffic and reductions in motor vehicle emissions. Based on a traffic increase of 4.1% over the four year period from 1994 to 1998 (approximately 1% per year) and an emissions decrease of approximately 17.8%, future year background levels of 4.3 ppm (one-hour) and 2.6 ppm (eight-hour) were calculated.

A detailed description of the microscale analysis technical approach is contained in Appendix D.

2.1.3 Microscale Analysis Results

Maximum predicted one- and eight-hour CO concentrations at sensitive receptors are summarized in Tables IV.2-1 and IV.2-2. These values represent highest potential concentrations as they are predicted during the simultaneous occurrence of "defined" worst case meteorology and peak traffic. The results include the contributions of the intersections studied, the proposed parking facilities, and background.

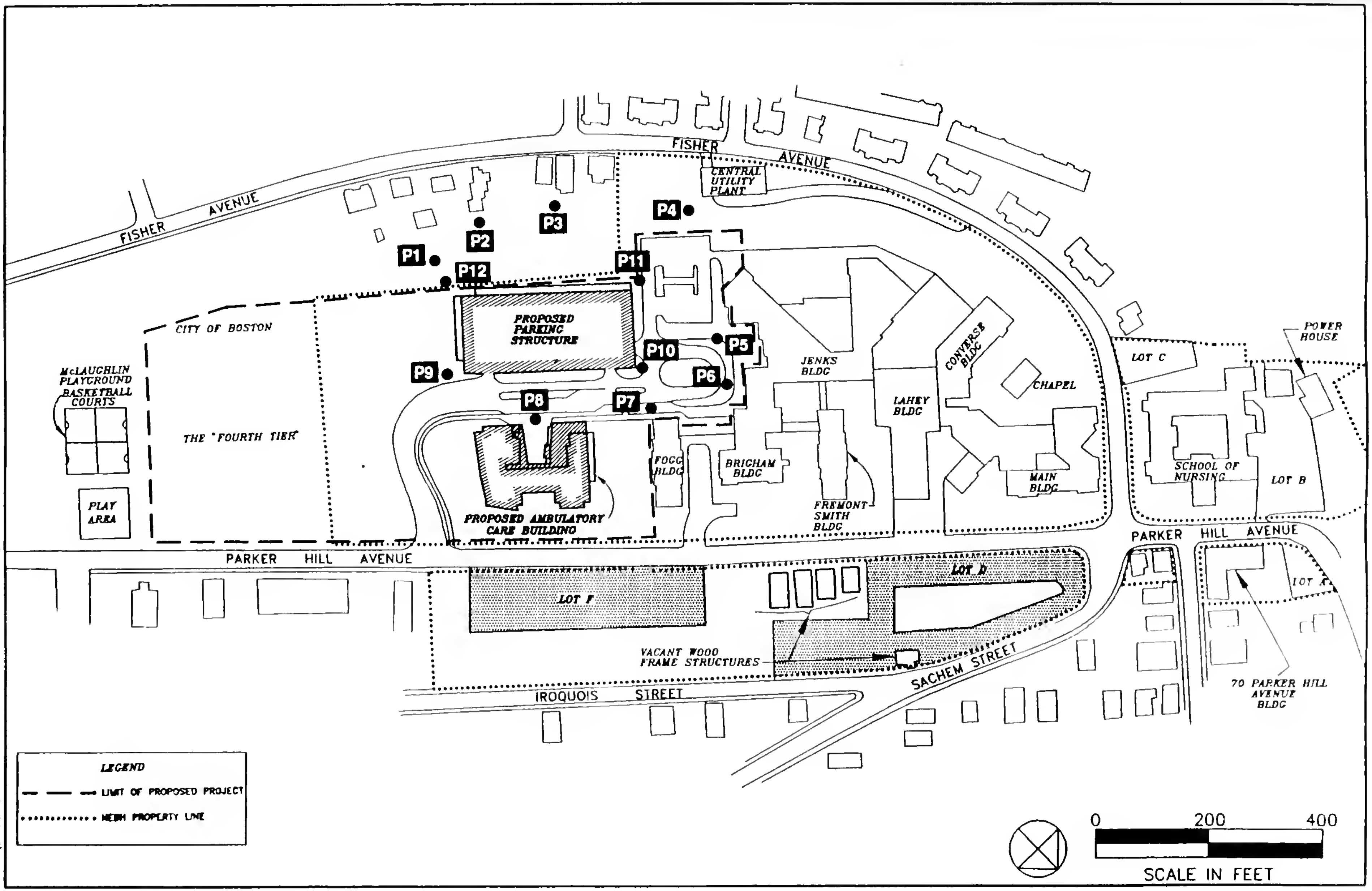

FIGURE IV.2-3
PARKING FACILITY RECEPTOR LOCATIONS
NEW ENGLAND BAPTIST HOSPITAL

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Table IV.2-1: Microscale Analysis
Maximum Predicted Ambient CO Concentrations (ppm) from Intersections, Parking Facilities and Background

Intersection	Receptor	Existing 1-Hr	Existing 8-Hr	Future No-Build 1-Hr	Future No-Build 8-Hr	Future Build 1-Hr	Future Build 8-Hr
Huntington Avenue/ South Huntington Avenue	A1	9.6	6.2	8.6	5.6	8.6	5.6
	A2	9.2	5.9	8.0	5.2	8.1	5.3
	A3	9.0	5.8	8.1	5.3	8.1	5.3
	A4	9.1	5.9	8.1	5.3	8.1	5.3
	A5	9.5	6.2	8.5	5.5	8.5	5.5
	A6	8.3	5.3	7.4	4.8	7.4	4.8
	A7	10.0	6.5	9.1	6.0	9.1	6.0
	A8	12.3	8.1	10.8	7.2	10.8	7.2
	A9	10.9	7.1	9.4	6.2	9.4	6.2
	A10	8.5	5.5	7.7	5.0	7.7	5.0
	A11	9.6	6.2	8.5	5.5	8.5	5.5
	A12	11.3	7.4	9.9	6.5	9.9	6.5
	A13	12.1	8.0	10.7	7.1	10.7	7.1
	A14	12.5	8.3	11.0	7.3	11.0	7.3
South Huntington Avenue/ Heath Street	B1	7.0	4.4	6.1	3.9	6.1	3.9
	B2	7.6	4.8	6.3	4.0	6.3	4.0
	B3	8.4	5.4	7.3	4.7	7.3	4.7
	B4	8.6	5.5	7.3	4.7	7.3	4.7
	B5	7.6	4.8	6.5	4.1	6.5	4.1
	B6	9.8	6.4	8.3	5.4	8.3	5.4
	B7	9.8	6.4	8.3	5.4	8.3	5.4
	B8	9.8	6.4	8.3	5.4	8.3	5.4
	B9	9.7	6.3	8.2	5.3	8.2	5.3
	B10	8.6	5.5	7.2	4.6	7.2	4.6
	B11	8.5	5.5	7.2	4.6	7.2	4.6
	B12	6.6	4.1	5.6	3.5	5.6	3.5
NAAQS*		**35.0**	**9.0**	**35.0**	**9.0**	**35.0**	**9.0**

* National Ambient Air Quality Standards (known as primary standards) do not allow ambient CO concentrations to exceed 35 parts per million (ppm) for a one-hour averaging period and 9 ppm for an eight-hour averaging period more than once per year at any location.

Table IV.2-2: **Parking Facility Receptors**

Receptor	Concentration (ppm) 1-Hour	Concentration (ppm) 8-Hour
P1	4.8	3.0
P2	4.6	2.8
P3	4.5	2.7
P4	4.5	2.7
P5	4.5	2.7
P6	4.4	2.7
P7	4.5	2.7
P8	4.6	2.8
P9	5.4	3.4
P10	5.0	3.1
P11	5.2	3.2
P12	5.3	3.3
NAAQS*	**35.0**	**9.0**

* National Ambient Air Quality Standards (known as primary standards) do not allow ambient CO concentrations to exceed 35 parts per million (ppm) for a one-hour averaging period and 9 ppm for an eight-hour averaging period more than once per year at any location.

Maximum predicted one- and eight-hour concentrations are summarized below by intersection.

Huntington Avenue/South Huntington Avenue

There were no exceedances of either the one-hour or eight-hour CO standard for any case at the intersection of Huntington Avenue and South Huntington Avenue. Highest CO concentrations occurred under the existing case where a maximum one-hour concentration of 12.5 ppm and a maximum eight-hour concentration of 8.3 ppm were predicted. These concentrations were reported at receptor A14 located west of the intersection along the south side of Huntington Avenue (see Figure IV.2-1).

During the future year, CO concentrations decrease from the existing case due to improved motor vehicle emissions. Maximum predicted concentrations are 11.0 ppm for the one-hour averaging period and 7.3 ppm for the eight-hour averaging period. These levels are predicted for both the No-Build and Build cases at receptor A14. The only increase in concentration with the Project occurred at receptor A2 (located along the north side of Huntington Avenue just to the west of the intersection). At this location, both one- and eight-hour levels increased by only 0.1 ppm. These concentrations are, however, all well below the air quality standards for CO of 35 ppm (one-hour) and 9 ppm (eight-hour).

South Huntington Avenue/Heath Street

Under the existing case, modeling demonstrated that both one-hour and eight-hour CO concentrations are below the ambient air quality standards of 35 ppm and 9 ppm, respectively. The maximum existing case concentrations of 9.8 ppm (one-hour) and 6.4 ppm (eight-hour) occur at receptors B6 through B8 located along the north side of Heath Street (see Figure IV.2-2).

For the future year cases, highest No-Build and Build concentrations of 8.3 ppm (one-hour) and 5.4 ppm (eight-hour) are predicted. Results at this intersection further demonstrate CO concentrations do not increase at any receptor with construction of the Project, since the Project adds only a small number of vehicles to this location during peak hours. As with the existing case, highest concentrations occur at receptors B6, B7 and B8. All future year concentrations at this intersection are below the ambient air quality standards for CO.

Local Parking Facility Receptors

In addition to receptors adjacent to the study intersections, a number of pedestrian level receptors closer to and around the Project's parking facilities were also evaluated. These receptors are identified in Figure IV.2-3, while ambient air concentrations at these locations are shown in Table IV.2-2. The results demonstrate CO concentrations are far below standards.

2.2 Conclusions

The results of the microscale analysis demonstrate ambient air quality standards for CO will be maintained with construction of the Project. Further, because the Project generates so few vehicles, the study demonstrated the Project has virtually no impact on air quality at the intersections evaluated.

3.0 SOLID AND HAZARDOUS WASTE

3.1 Site Investigations

A preliminary environmental evaluation has been completed for the Project site. Previous sub-surface geological investigations were conducted in 1984 and 1985 by Haley & Aldrich, Inc. (H&A) at the Project site.

In March 1994, HMM Associates performed a limited subsurface exploration program of current fill soils within the proposed building footprints. On the basis of these investigations, HMM concluded that there is no evidence of a significant petroleum product and/or hazardous materials release which would warrant reporting under the Massachusetts Department of Environmental Protection's (DEP) Massachusetts Contingency Plan (MCP) or present a health risk for children or adults. As such, there are no specific materials or petroleum product issues that would appear to prohibit on-site re-use of the fill material.

A Phase I Preliminary Site Assessment is currently in the process of being completed and additional evaluation of soils within the glacial till may be conducted as part of the deeper geotechnical exploration program if these soils are to be used for fill in the meadow and Fourth Tier areas.

3.2 Solid Waste

Solid waste generated by the Ambulatory Care Building will consist of typical office type waste, i.e., paper, cardboard, etc. The Hospital estimates that the new building will generate approximately two tons of solid waste per month, which will be removed from the building every day and put into the Hospital's trash compactor. The compactor is currently emptied twice every week and disposed of by a licensed contractor.

3.3 Medical Waste

Medical waste generated by the Ambulatory Care Building will consist primarily of a mix of "sharps" and dressings. The Hospital estimates that approximately 200 pounds per month of medical waste may be generated at the Ambulatory Care Building. This waste will be removed daily, stored in the Hospital's refrigerated infectious waste storage room located in the Lahey Building, and packaged, labeled and shipped three times per week, in compliance with all applicable regulations.

3.4 Recycling

The Hospital currently conducts a recycling program for paper products in an effort to reduce the amount of solid waste generation. NEBH will extend this program to include the new Ambulatory Care Building. In addition, the Hospital is expanding its recycling efforts to include a majority of the waste that will be generated in the Ambulatory Care Building. The Ambulatory Care Building will include a basement storage area for recyclable materials.

4.0 NOISE

4.1 Introduction

As required by the BRA scoping determination, a noise modeling study was conducted to assess the potential effect of the construction and operation of the Project's mechanical and exhaust systems and compliance with applicable regulations of the City of Boston. A description of the Project's mechanical and exhaust systems and their location is included in the report, as are proposed measures to minimize and eliminate adverse noise impacts on nearby sensitive receptors. The following analysis contains a discussion of the existing noise environment and estimates of the operational noise sources of the proposed Project. The results of the analysis have been compared to the noise standards published by the City of Boston.

The Hospital's existing facility produces very little sound that can be measured beyond the property boundary. The Project will similarly produce little sound that can be measured beyond the property boundary. The expected levels have been quantified and compared to applicable standards. This analysis concludes that the noise from the Project is expected to comply with the City of Boston Noise Standards.

The proposed Project will be located near the existing Hospital facility, east of the Fogg Building. Much of the existing noise in the area is generated by traffic and building mechanical equipment. Existing levels were quantified by an ambient noise survey. The noise levels of future facility equipment were estimated by published estimation procedures. All mechanical equipment will be located in the basement of the proposed building. The HVAC equipment has the potential to operate 24 hours per day, seven days per week. However, it will typically cycle on and off during periods of reduced demand, such as nighttime and weekend hours. Since all of the equipment may be operating at any time, it is assumed for the purposes of this analysis that all equipment is in constant operation (a worst case scenario).

4.2 Discussion of Noise Metrics

There are a number of ways in which sound (noise) levels are measured and quantified. All of them use the logarithmic decibel (dB) scale. The following is a brief introduction to the noise measurement terminology used in this noise analysis.

The Sound Level Meter used to measure noise is a standardized instrument.* It contains "weighting networks" to adjust the frequency response of the instrument to approximate that of the human ear under various circumstances. The network used in this and other community noise studies is the A-weighting network. A-weighted sound levels are reported in decibels designated as "dBA."

Because the sounds in our environment vary with time, they cannot simply be described with a single number. Two methods are used for describing variable sounds; the exceedance levels and the equivalent level. Both are derived from a large number of moment-to-moment A-weighted sound level measurements. Exceedance levels are designated L_n, where n can have any value from 0 to 100 percent. For example:

- L_{90} is the sound level in dBA exceeded 90 percent of the time during the measurement period. It is essentially the same as the residual sound level, which is the sound level observed when there are no obvious nearby intermittent noise sources.

- L_{50} is the median sound level: the sound level in dBA exceeded 50 percent of the time during the measurement period.

- L_{10} is the sound level in dBA exceeded only 10 percent of the time. The L_{10} is sometimes called the intrusive sound level because it is caused by occasional louder noises like those from passing motor vehicles.

By using exceedance levels it is possible to separate prevailing, steady noises (L_{90}) from occasional, louder noises (L_{10}) in the noise environment.

The equivalent level is the level of a hypothetical steady sound that would have the same energy (i. e. the same time-averaged mean square sound pressure) as the actual fluctuating sound observed. The equivalent level is designated L_{eq}, and is also A-weighted. The equivalent level represents the time average of the fluctuating sound pressure, but because sound is reported on a logarithmic (dB) scale and the averaging is done with linear mean square sound pressure values, the L_{eq} is strongly influenced by occasional loud, intrusive noises.

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* *American National Standard Specification for Sound Level Meters*, American National Standards Institute (ANSI) S1.4-1983, published by the Standards Secretariat of the Acoustical Society of America, NY.

When a steady sound is observed, all of the L_n and the L_{eq} are equal. The analysis of noises from operation of the proposed Project treats all noises as though they will be steady and continuous.

Measurement of levels within individual frequency ranges is essential to facilitate noise control design or to compare observed levels to applicable regulations. The frequency ranges are established by standard*. The spectrum shape or frequency content of the sound is important in noise modeling since sound waves of different frequencies vary in their propagation characteristics and the attenuation provided by obstacles such as barrier walls or intervening buildings. The frequency content of a sound can also affect the reaction that a community may have to the sound. The estimate of noise levels caused by the operation of the project are therefore presented in terms of octave band sound pressure levels.

4.3 Existing Noise Environment

An ambient noise level survey was conducted to characterize the existing acoustical environment in the vicinity of the site. Significant noise sources in the area around the site include traffic, mechanical equipment at surrounding facilities, MBTA and Conrail train activity and daytime construction activities.

Ambient noise level measurements were taken at several locations in the vicinity of the site which were representative of the residential and commercial locations nearest to the site. Since noise impacts are greatest when existing noise levels are lowest, the study was designed to measure community noise levels under conditions typical of a "quiet period" for the area. Measurements were made on a weekday between the hours of 5:30 AM and 7:30 AM. Most of the noise in the area is generated by distant sources so elevated receptors are expected to have higher background noise levels than ground level receptors. Therefore, all measurements were made at ground level.

4.3.1 Noise Measurement Locations

A survey of the area near the site was conducted to determine where noise from the proposed Project would have the greatest potential to be heard. The measurement locations are shown on Figure IV.4-1 and are described below.

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* *American National Standard Specification for Octave, Half Octave and Third-Octave Band Filter Sets,* ANSI S1.11-1966 (R1975).

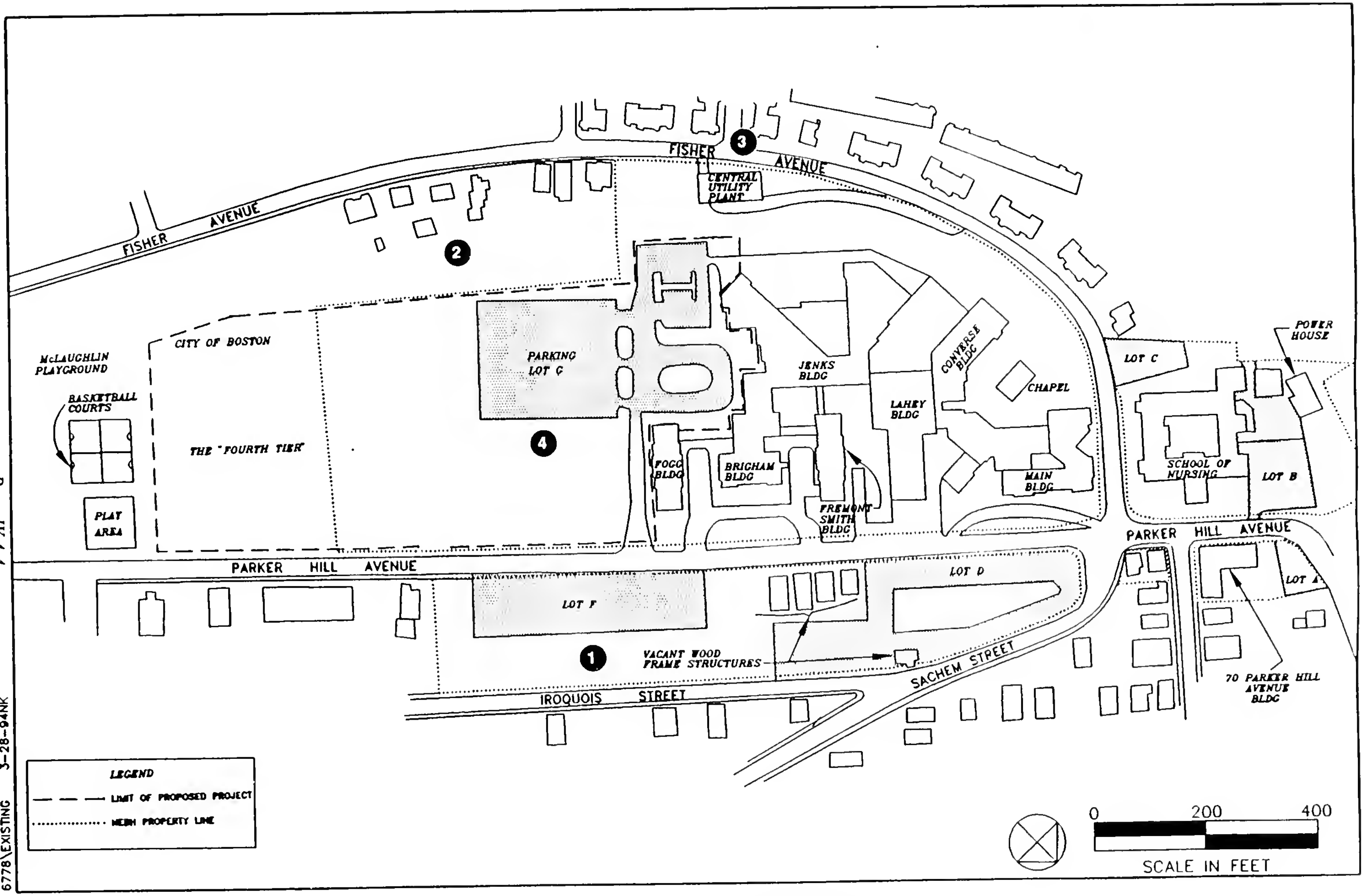

FIGURE IV.4-1
AMBIENT NOISE MEASUREMENT LOCATIONS
NEW ENGLAND BAPTIST HOSPITAL

HMM Associates, Inc.

Four measurement locations around the site were selected to obtain an adequate spatial representation of the ambient noise levels.

- ***Location 1*** - Near the closest residential properties to the north of the site. The measurements were taken across the street from the residences on New England Baptist Hospital property.
- ***Location 2*** - On a walking path to the south of the proposed Parking Structure. This location represents the nearest residences to the south.
- ***Location 3*** - On Ellingwood Street to the southwest of the proposed site. This location represents the nearest residences to the southwest of the facility, and is placed within the community to reduce the influence of the New England Baptist Hospital Central Power Plant.
- ***Location 4*** - On the east side of the Fogg Building. This represents the site noise levels and the existing levels at the existing Hospital.

4.3.2 Measurement Methodology

Meteorological conditions, based on field observations, were noted during the measurement survey. Wind speed was measured with a Dwyer hand held wind meter. Temperature data were collected by a pocket Mercury Thermometer. During the survey, skies were clear and the temperature was 27 degrees Fahrenheit with wind speeds of less than 5 miles per hour.

4.3.3 Survey Results

The results of the ambient noise surveys are tabulated in Table IV.4-1. Lists of major sources of noise observed during each sampling period are provided along with the measured levels. Background (L_{90}) ambient noise levels observed in and around the site ranged from 44 dBA to 52 dBA. The sound from traffic and distant urban activities dominated the existing sound field.

The New England Baptist Hospital is located on a hill overlooking the Longwood Medical Area to the north, several other hospitals to the south and urban communities in other directions. Massachusetts Route 9 passes within a quarter mile of the facility to the north, as does the Riverway/Jamaicaway to the west. Columbus Avenue and the AMTRAK main line pass approximately 1/2 mile to the east. Ambient noise levels at the Hospital property boundary are dominated by the urban din of these and other sources. In addition, the occasional sound of commercial aircraft and helicopter flights is added to the ambient levels.

TABLE IV.4-1: Ambient Noise Levels

Early Morning Survey, Thursday, March 18, 1994

RESIDUAL
OCTAVE BAND ANALYSIS
dB (re: 20 microPascals)

Position Description	31.5	63	125	250	500	1000	2000	4000	8000
	Octave band center frequency (Hz)								
1 North Property Line	60	59	51	49	44	35	28	25	18
2 South Property Line	61	62	56	50	49	44	33	27	20
3 Southwest Property Line	61	60	58	53	50	47	42	33	24
4 Project Site	65	63	60	51	46	40	36	35	30

OBSERVED STATISTICAL LEVELS
dBA (re 20 microPascals)

Position Description	Time*	L10	L50	L90	Leq	Noise Sources
1 North Property Line	6:06	46	44	44	45	Distant HVAC equipment, distant traffic, local traffic, light wind, occasional bird, distant aircraft, distant sirens.
2 South Property Line	7:04	50	48	47	48	Distant traffic, local traffic, Central Utility Plant, light wind, distant aircraft, distant sirens, equipment to south.
3 Southwest Property Line	6:32	62	54	52	61	Distant equipment south, distant traffic, light wind, distant aircraft, din south.
4 Project Site	7:29	53	49	47	52	Distant HVAC equipment, distant traffic, local traffic, light wind, occasional bird, distant aircraft, din all directions.

* Start time of 15 minute sample

Meteorology: Clear Skies, 27 deg. F, wind 1-3 mph from the southwest.

Sources of noise at the Hospital are limited to vehicles, the Central Utilities Building and some rooftop mechanical equipment. Noise from vehicles traveling to or from the Hospital were minimal due to the early hour of the survey. Most of the vehicular activity was centered around the main entrance. At least one ambulance was idling in the vicinity through the measurement at Location 4, the proposed site. While this made no distinguishable noise at the measurement location, it prevented measurement of ambient levels near the Jenks Building. Rooftop HVAC units and packaged chillers could be seen at several locations on Hospital buildings. Based upon a walking site survey, noise from these units could not be distinguished from other background sounds at any ground level location. The Central Utilities Building equipment was under typical operating loads during the measurements. Based on a qualitative observation at Location 3 across Fisher Avenue, the sound from the boiler operation is similar, in character and loudness, to other noise sources in the area. The highest background levels were measured at Location 2. No sounds from Hospital sources could be distinguished during this measurement.

Daytime levels can be expected to be generally higher due to increased traffic and community activity. With no heavy industry nearby, daytime levels are not expected to approach the 70 dBA threshold that would affect the application of the City of Boston Construction Noise criteria. Therefore, no daytime survey was conducted.

4.4 Applicable Community Noise Regulations and Criteria

The government regulations that may be applicable to community noise caused by activities at the Ambulatory Care Building are summarized below.

State

Massachusetts regulations (310 CMR 7.10) qualitatively prohibit noise under some circumstances. This is interpreted quantitatively by the Department of Environmental Protection (DEP) policy (DAQC policy 90-001) and their Form BWP AQ SFP-3, hereafter referred to as the DEP Noise Policy. The policy is described below.

"A source of sound will be considered to be violating the Department's noise regulation (310 CMR 7.10) if the source:

1) Increases the broad band sound level by more than 10 dBA above ambient, or

2) Produces a "pure tone" condition - when any octave band center frequency sound pressure level exceeds the two adjacent center frequency sound pressure levels by 3 decibels or more.

These criteria are measured both at the property line and at the nearest inhabited residence. Ambient is defined as the background A-weighted sound level that is exceeded 90% of the time measured during equipment operating hours. The ambient may also be established by other means with the consent of the Department."

The Massachusetts DEP commonly defers to local quantitative noise standards when they are available.

City of Boston

Specific criteria are provided by regulations of City of Boston Air Pollution Control Commission, "Regulations for the Control of Noise in the City of Boston," adopted December 17, 1976. The standards are based on the noise zone in which the receiver is located. Operational noise limits are shown in Table IV.4-2. Residential criteria were applied at all residential locations including the patient rooms at the existing hospital. The business criteria were assigned to the Fogg Building.

4.5 Operational Noise Evaluation

Noise control is an inherent consideration in the design of a major urban facility. The noise control designers must analyze all of the potential noise sources at the facility and all of the noise propagation paths between these sources and sensitive locations inside and outside of the facility. Specialized noise control treatment is then designed for each individual noise source identified to have the potential to exceed the project noise standard at sensitive locations.

At this time, the Ambulatory Care Building is in the preliminary design stage and detailed acoustic design is not feasible. The following noise impact analysis focuses on the major noise sources planned, and demonstrates that it is feasible to design the facility so that it will not produce excessive noise at sensitive areas at the receiving properties. Noise level estimates of individual sources are based on procedures from the acoustic literature. Final equipment design may include other equipment and mitigation methods but will have the same goal of meeting the applicable noise performance standards.

TABLE IV.4-2: City of Boston Table of Zoning District Noise Standards Maximum Allowable Sound Pressure Levels

Octave Band Center Frequency (Hz)	Residential Zoning District Daytime (dB)	Residential Zoning District All Other Times (dB)	Residential-Industrial Zoning District Daytime (dB)	Residential-Industrial Zoning District All Other Times (dB)	Business Zoning District Anytime (dB)	Industrial Zoning District Anytime (dB)
31.5	75	68	79	72	79	83
63	76	67	78	71	78	82
125	69	61	73	65	73	77
250	62	52	68	57	68	73
500	56	45	62	51	62	67
1000	50	40	56	45	56	61
2000	45	33	51	39	51	57
4000	40	28	47	34	47	53
8000	38	26	44	32	44	50
A-Weighted (dBA)	60	50	65	55	65	70

Notes

- Noise standards are extracted from Regulation 2.5, City of Boston Air Pollution Control Commission, "Regulations for the Control of Noise in the City of Boston", adopted December 17, 1976.
- All standards apply at the property line of the recieving property
- dB and dBA based on a reference pressure of 20 micropascals.
- Daytime refers to the period between 7:00 a.m. and 6:00 p.m. daily except Sunday.

4.5.1 Noise Level Prediction Methodology

Five locations were modeled as noise receptors for the study. These modeling locations are shown on Figure IV.4-2. Modeling results indicate the predicted combined sound pressure levels outside the windows of receptor locations as a result of project noise sources. Noise estimates are calculated at the nearest location at both residential and commercial receptors. Preliminary calculations were performed to identify the locations and elevations at the receptor locations where the project noise levels are expected to be highest. These assumptions were then used in the modeling to assure that the results represented worst case estimates.

Potential noise sources planned for the Ambulatory Care Building include air handling units and other mechanical equipment to be located in the basement of the building. Minor sources such as bathroom exhaust fans were not included in this study. It is not anticipated that these noise sources would be noticeable at any modeled receptor. The Parking Structure will be of an open air design so the use of ventilation fans will not be required. More details of the inputs and assumptions used in the calculation of combined noise levels are provided in Appendix E.

4.5.2 Modeling Results

Expected noise emitted from each source was modeled at nearby sensitive receptors. Results of the analysis are provided in Tables IV.4-3 through IV.4-8. The tables provide the expected noise level from individual sources at each receptor as well as the combined noise level of all modeled facility noise sources. The results are also compared to the applicable criteria from the City of Boston Noise Ordinance. The analysis indicates that the Project will comply with the City of Boston Noise Ordinance. The Project-related noise levels are expected to be well below the Boston Noise Ordinance limits and existing levels at all modeled locations.

Although the final design of the Ambulatory Care Building may be different from that modeled, the designers intend to strive to continue to meet the requirements of the Boston Noise Ordinance at sensitive receptor locations.

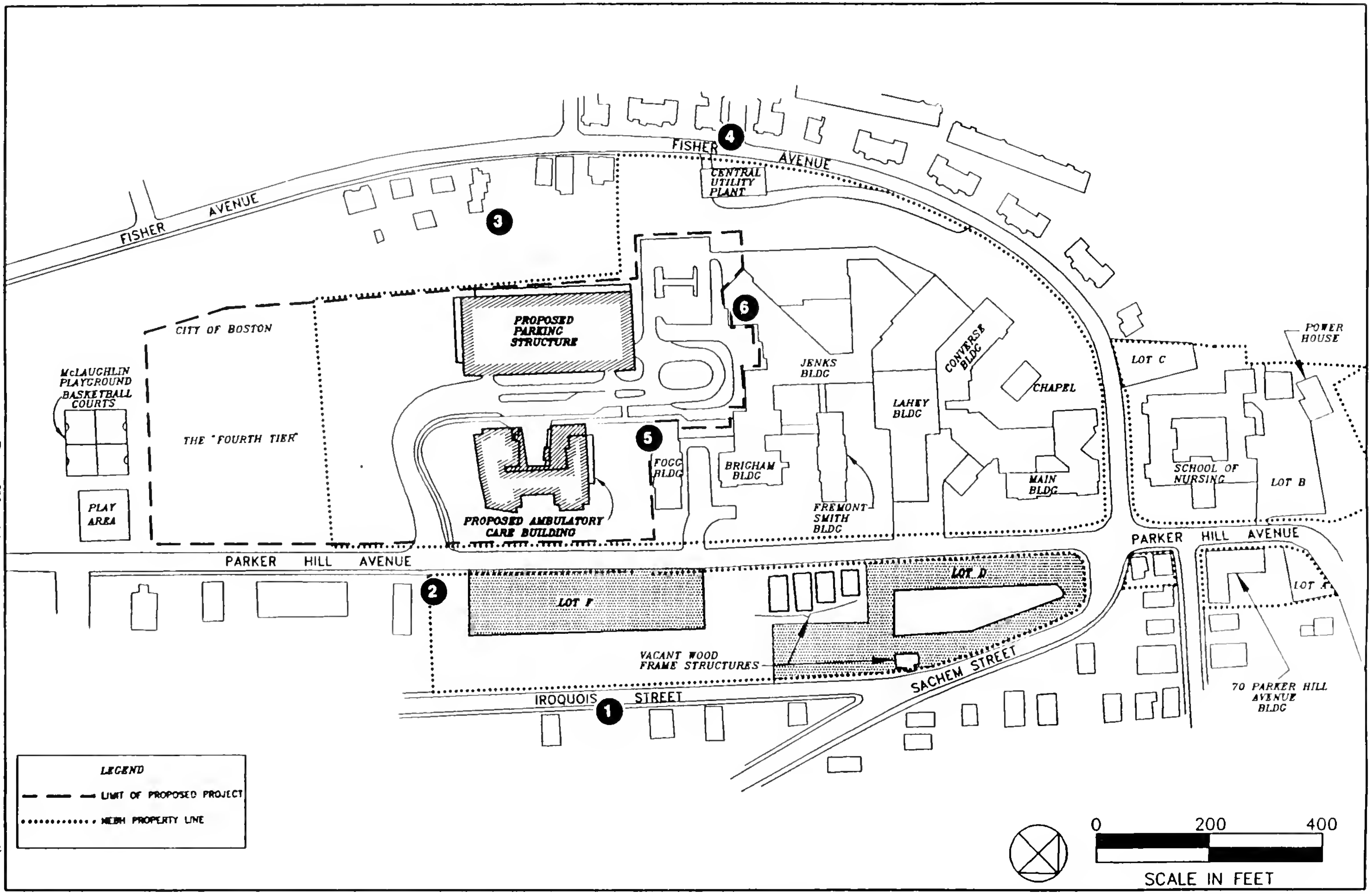

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FIGURE IV.4-2
NOISE MODELING LOCATIONS
NEW ENGLAND BAPTIST HOSPITAL

HMM Associates, Inc.

TABLE IV.4-3: COMBINED NOISE LEVELS AT THE NORTH PROPERTY LINE

dB (re 20 microPascals)

Contributing Source	dBA	OA	31.5	63	125	250	500	1000	2000	4000	8000
			Octave Band Center Frequency (Hz)								
1. Air Handler Inlets	21		37	36	35	22	13	13	5	-4	-15
2. Air Handler Exhaust Vent	18		34	33	32	19	10	10	3	-7	-18
COMBINED TOTAL	23	42	39	37	36	24	15	15	7	-2	-13
Residential Zoning Limit	50		68	67	61	52	45	40	33	28	26
DIFFERENCE	-27		-29	-30	-25	-28	-30	-25	-26	-30	-39

TABLE IV.4-4: COMBINED NOISE LEVELS AT RESIDENCES TO THE NORTHEAST

dB (re 20 microPascals)

Contributing Source	dBA	OA	31.5	63	125	250	500	1000	2000	4000	8000
			Octave Band Center Frequency (Hz)								
1. Air Handler Inlets	19		34	33	32	20	10	10	2	-7	-20
2. Air Handler Exhaust Vent	16		31	30	29	17	7	7	0	-10	-23
COMBINED TOTAL	20	40	36	35	34	22	12	12	4	-6	-18
Residential Zoning Limit	50		68	67	61	52	45	40	33	28	26
DIFFERENCE	-30		-32	-32	-27	-30	-33	-28	-29	-34	-44

TABLE IV.4-5: COMBINED NOISE LEVELS AT THE SOUTH PROPERTY LINE

dB (re 20 microPascals)

			Octave Band Center Frequency (Hz)								
Contributing Source	dBA	OA	31.5	63	125	250	500	1000	2000	4000	8000
1. Air Handler Inlets	22		37	36	35	23	14	13	6	-3	-14
2. Air Handler Exhaust Vent	19		34	33	32	20	11	10	4	-6	-17
COMBINED TOTAL	24	43	39	38	37	25	15	15	8	-1	-13
Residential Zoning Limit	50		68	67	61	52	45	40	33	28	26
DIFFERENCE	-26		-29	-29	-24	-27	-30	-25	-25	-29	-39

TABLE IV.4-6: COMBINED NOISE LEVELS AT THE SOUTHWEST PROPERTY LINE

dB (re 20 microPascals)

			Octave Band Center Frequency (Hz)								
Contributing Source	dBA	OA	31.5	63	125	250	500	1000	2000	4000	8000
1. Air Handler Inlets	17		33	32	31	18	9	8	0	-9	-22
2. Air Handler Exhaust Vent	14		30	29	28	15	6	5	-2	-12	-25
COMBINED TOTAL	19	38	35	34	32	20	11	10	2	-8	-20
Residential Zoning Limit	50		68	67	61	52	45	40	33	28	26
DIFFERENCE	-31		-33	-33	-29	-32	-34	-30	-31	-36	-46

TABLE IV.4-7: COMBINED NOISE LEVELS AT THE FOGG BUILDING

dB (re 20 microPascals)

						Octave Band Center Frequency (Hz)					
Contributing Source	dBA	OA	31.5	63	125	250	500	1000	2000	4000	8000
1. Air Handler Inlets	43		53	53	53	43	36	38	33	27	19
2. Air Handler Exhaust Vent	40		50	50	50	40	33	35	31	24	16
COMBINED TOTAL	45	60	55	55	55	45	38	40	35	29	21
Business Zone Limit	65		79	78	73	68	62	56	51	47	44
DIFFERENCE	-20		-24	-23	-18	-23	-24	-16	-16	-18	-23

TABLE IV.4-8: COMBINED NOISE LEVELS AT THE JENKS BUILDING

dB (re 20 microPascals)

						Octave Band Center Frequency (Hz)					
Contributing Source	dBA	OA	31.5	63	125	250	500	1000	2000	4000	8000
1. Air Handler Inlets	25		41	40	39	26	17	17	9	1	-11
2. Air Handler Exhaust Vent	22		38	37	36	23	14	14	7	-2	-14
COMBINED TOTAL	27	46	42	41	40	28	19	19	11	2	-9
Residential Zoning Limit	50		68	67	61	52	45	40	33	28	26
DIFFERENCE	-23		-26	-26	-21	-24	-26	-21	-22	-26	-35

4.6 Noise Mitigation

NEBH has made a significant commitment to noise control in the design of the Ambulatory Care Building. The design of the Parking Structure eliminates the need for mechanical ventilation which would have otherwise been a noise source. The proposed packaged air handling equipment is of current design which includ built-in noise control features. In addition, the package is vented to the ..tside through an areaway which will provide acoustic benefits. Additional chiller capacity will be provided at the location of existing hospital mechanical equipment, so the net noise effect will be minimized. The study indicates that no further noise mitigation is required.

5.0 GEOTECHNICAL

5.1 Introduction

Preliminary geotechnical information for the Hospital owned portion of the site (excluding the Fourth Tier of McLaughlin Playground) was provided by Haley & Aldrich, Inc. (H&A). This information is based on test borings conducted by H&A at the site in November 1984 in connection with another planned building project which was not pursued at that time (see Appendix F). Additional geotechnical explorations are being planned and may be available at the time of submission of the Final Project Impact Report.

5.1 Existing Site Conditions

5.1.1 Site Conditions

The Hospital portion of the site is currently occupied by a paved parking lot and grassed landscaped areas. Ground surface in the paved area ranges from approximately El. 215 to El. 222 (Boston City Base, BCB). The landscaped area (on the site of the Ambulatory Care Building) is relatively level at about El. 225, but slopes down to Parker Hill Avenue along the perimeter of the site. The site is generally elevated compared to surrounding land.

5.1.2 Soil Conditions

Five test borings within or immediately adjacent to the building site were completed by H&A in 1984 (see Appendix F). The borings indicated the presence of man-placed fill overlying natural glacial till soils beneath thin pavement or topsoil. The fill, ranging in thickness from about 5 feet to 13 feet at the test borings, was typically described as relatively loose sandy silt or silty sand with clay, gravel and cobbles. It was considered likely that the fill is reworked glacial till. The natural glacial till underlying the fill typically consists of dense to very dense silty sand with varying amounts of clay, cobbles and boulders. The test borings generally terminated in the glacial till, to maximum depth of 81.5 feet.

5.1.3 Groundwater Levels

Groundwater levels at the building site varied significantly due to the relatively low permeability of the glacial till soils and the elevated site topography. Data on subsurface water levels were taken in the 1984 study from two groundwater observation wells installed in completed test boreholes. Water levels measured ranged from El. 160 to El. 180, approximately 45 to 65 feet below typical ground surface.

5.2 Geotechnical Effects of the Project

5.2.1 Foundation Construction Procedures

The 1984 data indicate that the subsurface soil and water conditions are favorable for construction of the building foundations for the proposed Project. It is anticipated that reinforced concrete footing or mat foundations and soil-supported floor slabs-on-grade will be employed.

Excavations for foundation construction will range in depth from approximately 15 feet to 25 feet. Due to the favorable soil and water conditions and distance away from other structures, it is anticipated that essentially all of the excavation could be open-cut using conventional equipment and procedures.

As soil-supported footing foundations are anticipated, noise and vibrations which would be associated with installation of piles or other deep foundations will not occur.

As the lowest floors will be below finished exterior grade and possibly below maximum groundwater levels, measures will be required to eliminate or resist potential excess hydrostatic uplift pressures. Measures to avoid possible leakage into the below-grade structures will also be necessary.

5.2.2 Construction Dewatering

The lowest floor slabs for the Ambulatory Care Building and Parking Structure are planned to be at approximately El. 208 and El. 200, respectively. At these elevations, the slabs are at least 20 feet above the highest water levels measured in observation wells in 1984. Due to the likely low water levels and the relatively low permeability of the glacial till soils, construction dewatering requirements are not expected to be significant. Any dewatering can likely be accomplished with open sump pumping.

Due to the very limited construction dewatering requirements and the low soil permeability, no adverse impacts on area groundwater levels are expected during construction. Similarly, no adverse impact on permanent area groundwater levels is anticipated.

Permits for dewatering will be obtained from U.S. Environmental Protection Agency (NPDES Permit), Massachusetts Environmental Protection Department and the Boston Water and Sewer Commission, as required.

5.2.3 Protection of Nearby Structures

Existing structures and facilities are a relatively significant distance away from the proposed building excavations. The nearest off-site structures are at least 130 feet from the proposed excavations. The nearest on-site Hospital structure (Fogg Building) is approximately 75 feet away from the proposed Ambulatory Care Building excavation. Parker Hill Avenue is 50 feet from the closest excavation, and is at a similar elevation as the bottom of the excavation. Due to the competent nature of the site soils and the probable open-cut excavation configuration, excavation-related movements of the ground outside the excavations are expected to be very small and not extend outside the limits of the site.

Accordingly, existing buildings, utilities and other facilities are not anticipated to be adversely affected by excavation-related settlements or ground movements. Routine observations of the ground surface outside the excavation will be performed to confirm the anticipated favorable excavation performance. There will be no adverse drainage effects on neighboring properties due to the excavation.

5.2.4 Disposal of Excavated Materials

Based on available test boring logs and recent soil fill quality assessment data, the material expected to be excavated consists of fill over heterogenously graded, natural glacial till soils. An assessment of the overlying till soils indicated that there was no evidence of a significant petroleum product and/or hazardous materials release which would warrant reporting under the Massachusetts Contingency Plan or present health risk for children or adults. Based on this limited subsurface exploration program, on-site reuse of the fill material as structure backfill and fill for landscape elements would be possible. Any material not determined to be appropriate for reuse will be removed from the site in accordance with all applicable requirements and regulations.

6.0 CONSTRUCTION

A Construction Management Plan (CMP) will be developed prior to the start of construction, and will include specific mitigation measures and staging plans to minimize effects upon abutters. The Final Project Impact Report will contain more detail on the information to be contained in the CMP.

6.1 Construction Schedule

The construction of the Project is expected to start in September of 1994 and extend for approximately 16 months. Normal construction hours for the project will be from 7:00 AM to 4:00 PM, Monday through Friday. Certain construction activities such as steel erection, foundation preparation, and concrete casting may require extended hours or work on Saturdays.

A preliminary construction schedule is shown on Table IV.6-1. Completion of the Project is expected to occur in December 1995.

6.2 Construction Staging and Perimeter Protection

A separate construction entrance will be created at the eastern edge of the Project site (generally in the alignment of the proposed access roadway), allowing the existing entrance road to remain until the end of project construction. It is expected that construction fencing will be built around the entire Project site (see Figure IV.6-1) and that care will be taken to protect existing trees and plantings in the meadow and Fourth Tier areas, and between the Parking Structure and Fisher Avenue residences.

Once the above preparatory work is complete, building construction can commence on the Parking Structure and Ambulatory Care Building and the below level connectors between the Parking Structure and the Ambulatory Care Building.

Once construction in the Ambulatory Care Building is substantially complete, the construction entrance will be turned into the new, permanent Hospital entrance. Once finished, the old roadway will be removed and the balance of the landscaping can be completed.

Throughout the construction period, trailers necessary for construction will be located within the limits of the construction fence, probably to the west of the Parking Structure. Care will be taken to protect existing trees and plantings in staging areas.

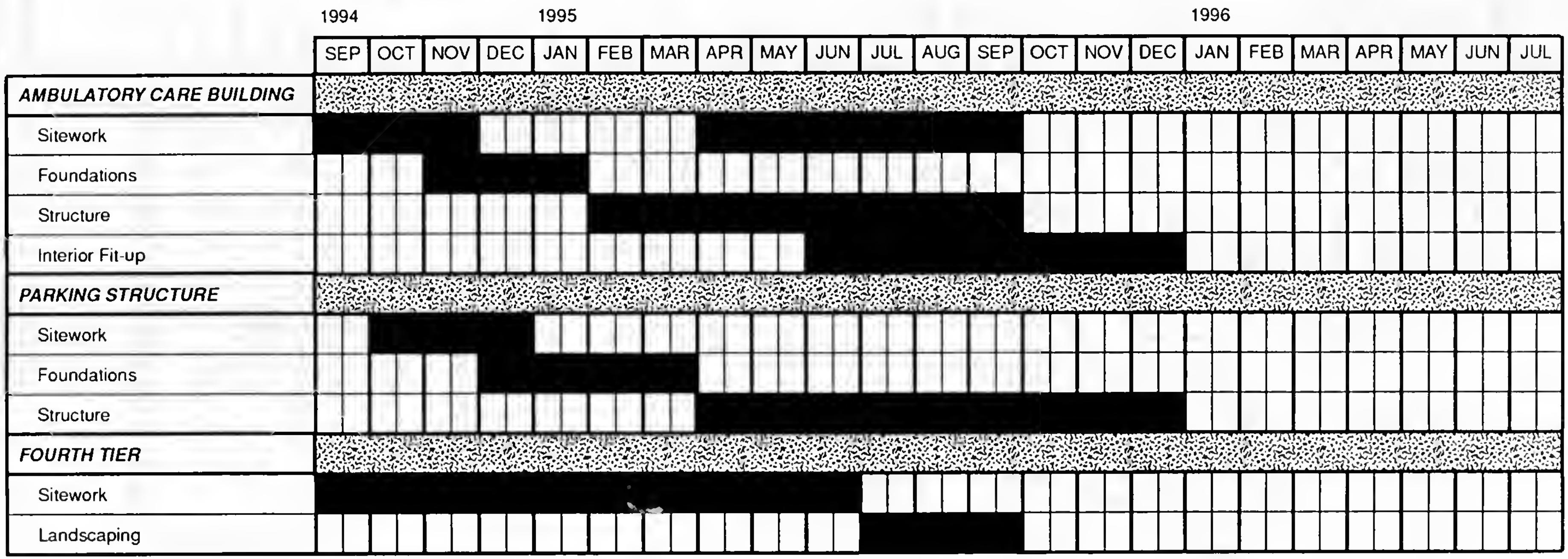

TABLE IV.6-1
PRELIMINARY CONSTRUCTION SCHEDULE

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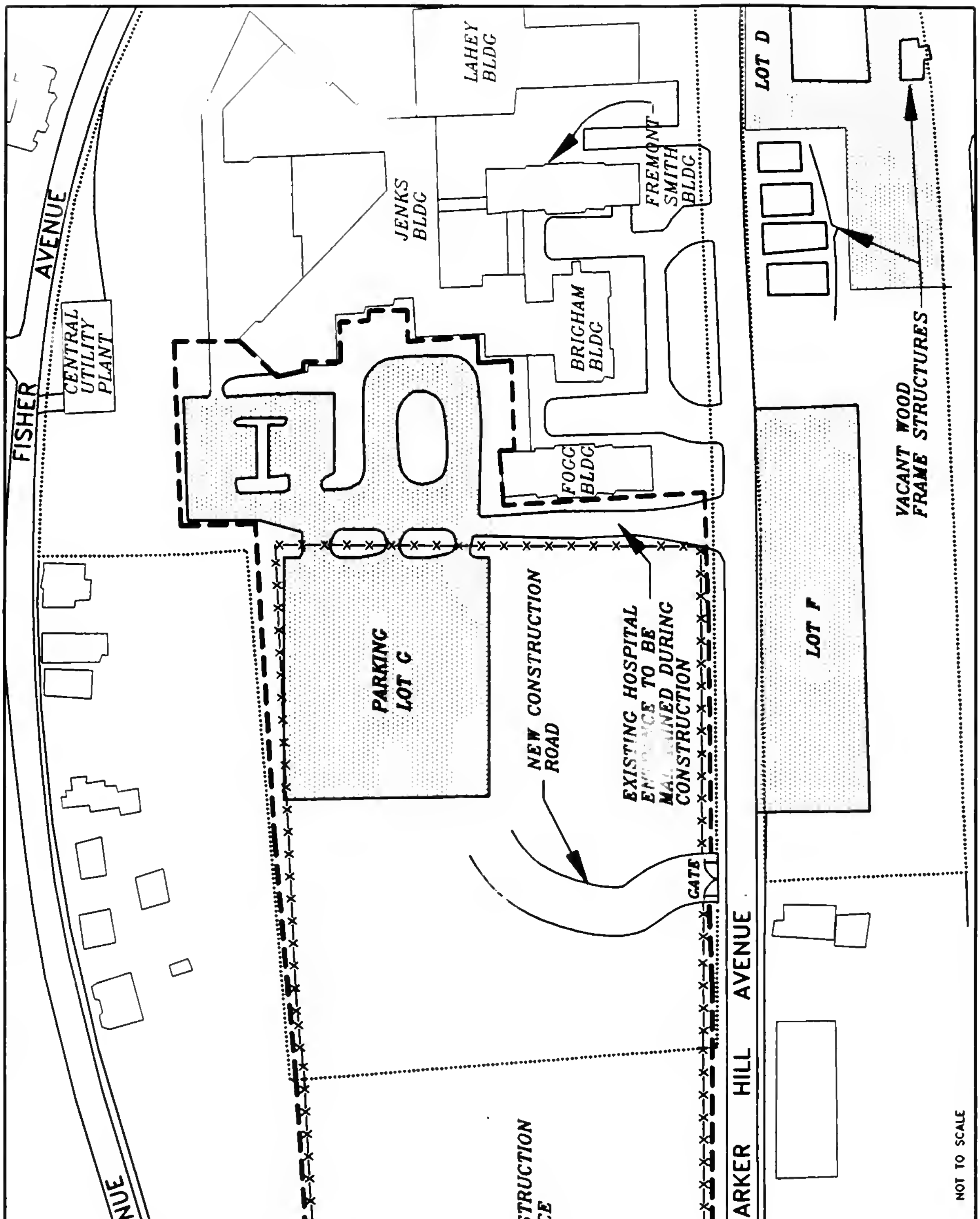

FIGURE IV.6-1
CONSTRUCTION STAGING AREAS
NEW ENGLAND BAPTIST HOSPITAL

6.3 Truck Routes and Volumes

Trucks will be used to remove material excavated from the Project site and to deliver construction materials to the site. The level of traffic will vary depending on the specific construction phase. The greatest volume of truck traffic can be expected during the three-month period when the Parking Structure is being erected at the same time as the concrete portions and exterior walls of the Ambulatory Care Building are being completed. During this period, up to 40 concrete trucks per day can be expected to enter and leave the site. Forty trucks, however, distributed over an eight-hour period, are not anticipated to impact traffic conditions. These estimated volumes will be refined when a contractor is engaged and the construction schedule finalized.

Limiting the effect of construction traffic and noise on the adjacent neighborhood will be a key goal of the Construction Management Plan. Routes will be chosen that use major thoroughfares as much as possible, and minimize the use of residential streets.

The hill on Parker Hill Avenue from Huntington Avenue, and the tight turn to the left at the top of this hill, makes an approach from the west unattractive both from a construction access viewpoint and from a traffic maintenance viewpoint. Therefore, all construction traffic should approach and leave the site from one direction, subject to concurrence with the Boston Traffic Department. Traffic will approach or leave the site by Parker Hill Avenue to Fisher Avenue to Estey (or Hayden) to Heath Street to either South Huntington Avenue or to Columbus Avenue. This routing was successfully used for trucks during construction of the Hospital's Jenks Building during the 1980's. (See Figure IV.6-2 for routing plan.).

It should also be noted that there will be considerable reduction in truck traffic entering and leaving the neighborhood during the excavation period if the expected 40,000 cubic yards of fill to be excavated from the site is reused to landscape the meadow and Fourth Tier areas.

6.4 Employee Trip Generation and Construction Worker Parking

The number of workers required during construction will vary, with an estimated peak work force of approximately 100 workers occurring during the interior fit up stage of construction. As the construction workers arrive between 6:00 and 7:00 AM and depart between 3:00 and 4:00 PM, the construction traffic is not expected to have a significant impact on the peak hour traffic.

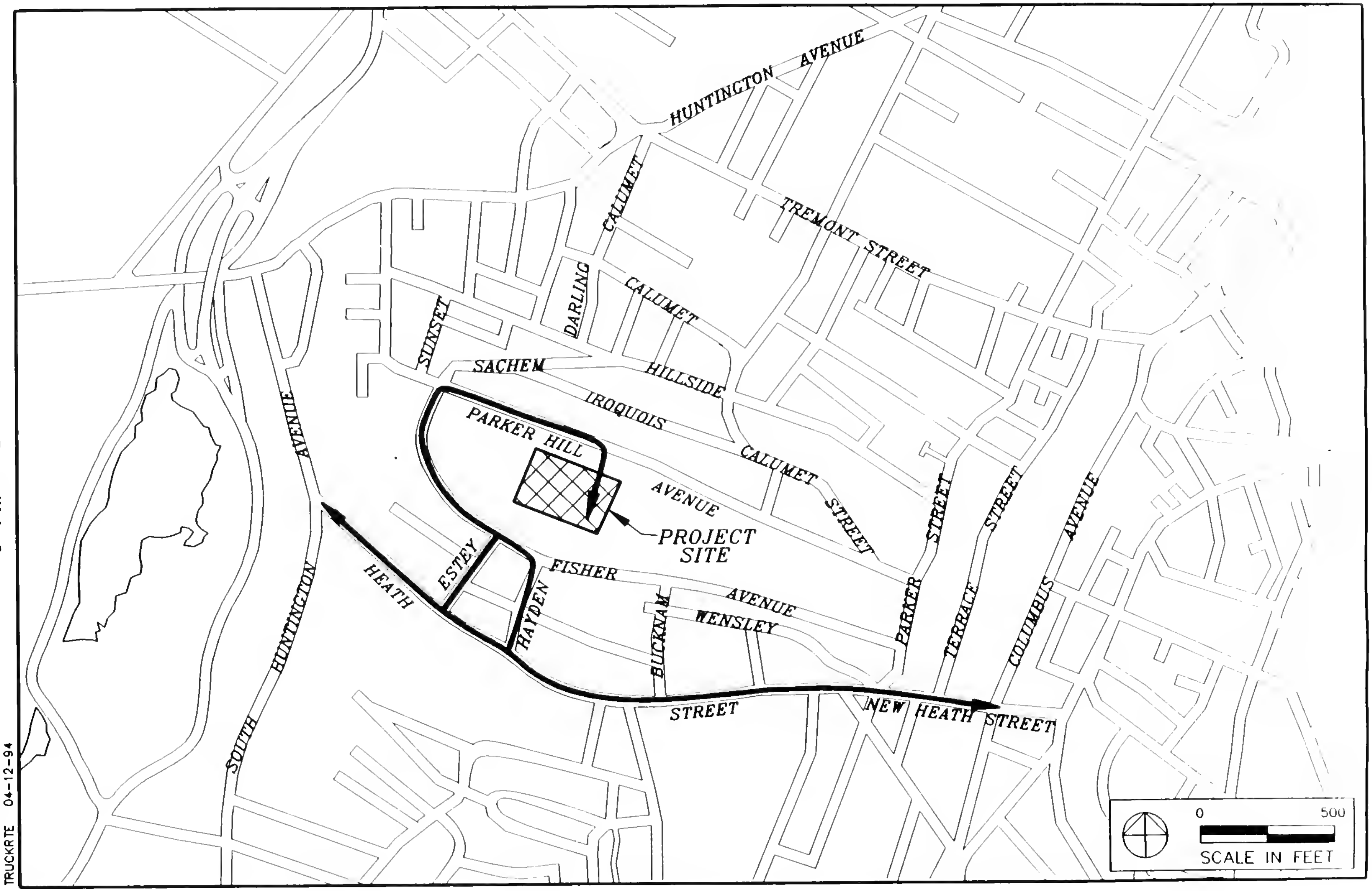

FIGURE IV.6-2
CONSTRUCTION TRUCK ROUTES
NEW ENGLAND BAPTIST HOSPITAL

Construction worker parking will be the responsibility of the construction manager. However, it is anticipated that there will be no on-site parking for construction workers and that the contractor will be responsible for shuttling in workers to the site. In addition, workers will be encouraged to take public transportation to the Project site. Space on-site will be made available for workers' supplies and tools so that they do not have to be brought to the site each day.

Table IV.6-2 summarizes the "Construction Phasing Parking Summary." Column 1 of this table summarizes the existing parking spaces; Column 2 summarizes the spaces which will be available during the construction period of the building and Parking Structure. (This assumes that 40 spaces will remain functional in the area of Lot G, and that new off-site parking will be secured for approximately 120 spaces.) Finally, the last column, Column 3, shows the total future parking spaces.

6.5 Construction Air Quality

6.5.1 Potential Effects

During the construction period of the Project, temporary effects on air quality at, and adjacent to, the site may occur. Land clearing, ground excavation, and other construction activities may generate fugitive dust, which will result in localized increases in airborne particulate levels. The amounts of fugitive dust emissions from these activities will depend on such factors as the properties of the emitting surfaces (e.g., soil silt content, moisture content, and volume of spoils), meteorological variables, and the construction practices employed.

6.5.2 Mitigation

To reduce emissions of fugitive dust and minimize effects on the local environment, a number of strictly enforced mitigation measures will be adhered to. These include:

- During dry periods, wetting agents will be used on areas of exposed soil and during demolition on a scheduled basis.
- Covered trucks will be used for the transportation of excavated material and demolition debris.
- On-site storage of debris will be minimized.
- Aggregate storage piles will be located away from areas having the greatest pedestrian activity.

Table IV.6-2 New England Baptist Hospital Construction Period Parking Supply Summary

	1	2	3
	Existing Parking Supply	**Ambulatory Care Building & Parking Structure Const. Period Parking Supply**	**Future Parking Supply**
<u>On-Campus Spaces</u>			
Lot A	8	8	8
Lot B	41	41	41
Lot C	18	18	18
Lot D	136	136	200
Lot F	87	87	*
Lot G	185	40	40
Parking Structure	--	--	422
Subtotal	**475**	**330**	**729**
<u>Off-Campus Spaces</u>			
Brookside Avenue (leased)	120	120	0
New Off-Site Lot (to be acquired)	0	120	120
Subtotal	**120**	**240**	**120**
TOTAL	**595**	**570**	**849**

* Lots D and F are proposed to be relandscaped following completion of the Project; that landscaping will result in consolidation of these lots into one lot and a decrease in total parking spaces from 223 to 200.

- Actual construction practices will be monitored to ensure that unnecessary transfers and mechanical disturbances of loose materials are minimized.

- Streets and sidewalks will be periodically cleaned to minimize dust accumulations.

6.6 Construction Noise

NEBH is committed to mitigate noise impacts from the construction of the Project. Increased community sound levels, however, are an inherent consequence of construction activities. Community noise increases, however, are expected to be limited to daytime levels for only the construction period.

Daytime ambient noise levels (L_{10}) were measured to be between 44 dBA and 52 dBA in the vicinity. It is the goal of this Project to operate within the criteria of the Boston Noise Ordinance and thereby minimize the noise contribution to existing ambient levels. There may be times when nighttime construction activities are required to maintain public safety while working around the Hospital. This will be minimized and coordinated with the Department of the Environment.

A detailed noise evaluation was conducted to estimate the noise levels during construction, by phase, and is provided in Appendix E - Noise. Calculations, assumptions and methodology of the study are also provided in the Appendix. Based on the results of the study, the project will comply with the construction noise standards of the City of Boston.

Construction Noise Mitigation

Every reasonable effort will be made to minimize the noise impact of construction activities. Mitigation measures may include:

- Using appropriate mufflers on all equipment and on-going maintenance of intake and exhaust mufflers.

- Muffling enclosure on continuously running equipment, such as air compressors and welding generators.

- Replacing specific construction operations and techniques by less noisy ones where feasible - e.g., mixing concrete off-site instead of on-site.

- Selecting the quietest of alternate items of equipment - e.g., electric instead of diesel-powered equipment, hydraulic tools instead of pneumatic impact tools.

- Scheduling equipment operations to keep average levels low, to synchronize noisiest operations with items of highest ambient levels.
- Turning off idling equipment.
- Locating noisy equipment as far as possible from sensitive areas.

6.7 Foundation Construction

Section 5.0 includes a more detailed description of the foundation construction procedures and mitigation measures concerning groundwater effects.

The available data indicate that the subsurface soil and water conditions are favorable for construction of the building foundations. It is probable that reinforced concrete footing or mat foundations and soil-supported floor slabs-on-grade will be feasible.

Permits for dewatering will be obtained from EPA (NPDES), DEP and the Boston Water and Sewer Commission, as required.

6.8 Construction Debris

The bulk of construction debris will consist of non-contaminated concrete, steel, metal, wood, brick, and roofing material. Some steel, wood, and metal may be salvaged and the rest will be removed by the contractor. The waste will be disposed of in an approved landfill under the authority of the contractor. The naming of specific sites for disposal is premature at this time since conditions and available disposal sites may change by the time construction begins. The Contractor will, however, assume full responsibility for disposing of construction debris appropriately in accordance with applicable regulations.

6.9 Excavated Soil Reuse in Meadow and Fourth Tier Areas

The Hospital has considered reuse of the existing soil excavate from below the Ambulatory Care Building and Parking Structure areas to landscape the Hospital's meadow and City's Fourth Tier areas. As discussed, this would be feasible if the soil quality meets minimum standards as determined by the Massachusetts Contingency Plan and the City's Parks and Recreation Department, and that the overall landscape plan for these areas is approved by the City.

6.10 Rodent Control

The City of Boston has declared that the infestation of rodents in the City is a serious problem. In order to control this infestation, the City has established requirements under the Massachusetts State Sanitary Code, Chapter II, 105 CMR 410.550 and the State Building Code, Section 108.6. Policy Number 87-4 establishes that extermination of rodents shall be required for issuance of permits for demolition, excavation, foundation, and basement rehabilitation. Currently, there are no known rodent problems presently at the site.

A rodent extermination certificate will be filed with the building permit application to the City. Rodent inspection monitoring and treatment will be carried out before, during, and at the completion of all foundation work for the Project, in compliance with the City's requirements. Rodent extermination prior to work start-up will consist of treatment of areas throughout the site. During the construction process, regular service visits will be made in order to maintain effective rodent control levels.

V. URBAN DESIGN COMPONENT

V. URBAN DESIGN COMPONENT

1.0 PROJECT DESCRIPTION

1.1 Site Location

The proposed site of the Ambulatory Care Building and Parking Structure lies within NEBH property and City of Boston owned land to the east of the existing Hospital buildings at the crest of Parker Hill (see Figure V.1-1). The closest existing building to the proposed Project is the Fogg Building. The Parking Structure will sit on the approximate site of the Hospital's existing surface Parking Lot G. The proposed new entry drive is located to the east of the proposed Ambulatory Care Building (see Figure V.1-2, Site Plan). Existing grade elevations within the Project area range from 215 feet to approximately 230 feet (Boston City Base).

South of the proposed Parking Structure is a wooded area that separates houses along Fisher Avenue from the Hospital campus. East of the proposed Ambulatory Care Building and Parking Structure is open green space (the meadow) within Hospital property. Further east is more open green space and the Fourth Tier of the McLaughlin Playground. The Project site commands outstanding panoramic views to the north, east and south.

Part of the proposed landscape and regrading plan for the open space east of the Parking Structure involves land (the Fourth Tier) owned by the City and under the jurisdiction of the City of Boston Department of Parks and Recreation. Discussions to coordinate landscape improvements within the Project site with those on City land have been held by the Project Team with the Parks and Recreation Commission and the community.

1.2 Existing Uses

The Project site is currently used for surface parking (Lot G) and as an open green area. A portion of the Fourth Tier was previously used by the Hospital for parking but has since been returned to open space uses.

1.3 Need for Proposed Project

As is the case throughout the health care industry, the demand for ambulatory care at the Hospital has grown more rapidly than inpatient care. The Hospital, therefore, has a need to develop clinical service areas dedicated to the ambulatory patient, and new medical offices which serve these patients. To meet this growing demand, the Hospital proposes to construct a new

FIGURE V.1-1
AERIAL PHOTO OF AMBULATORY CARE BUILDING
& PARKING STRUCTURE SITE

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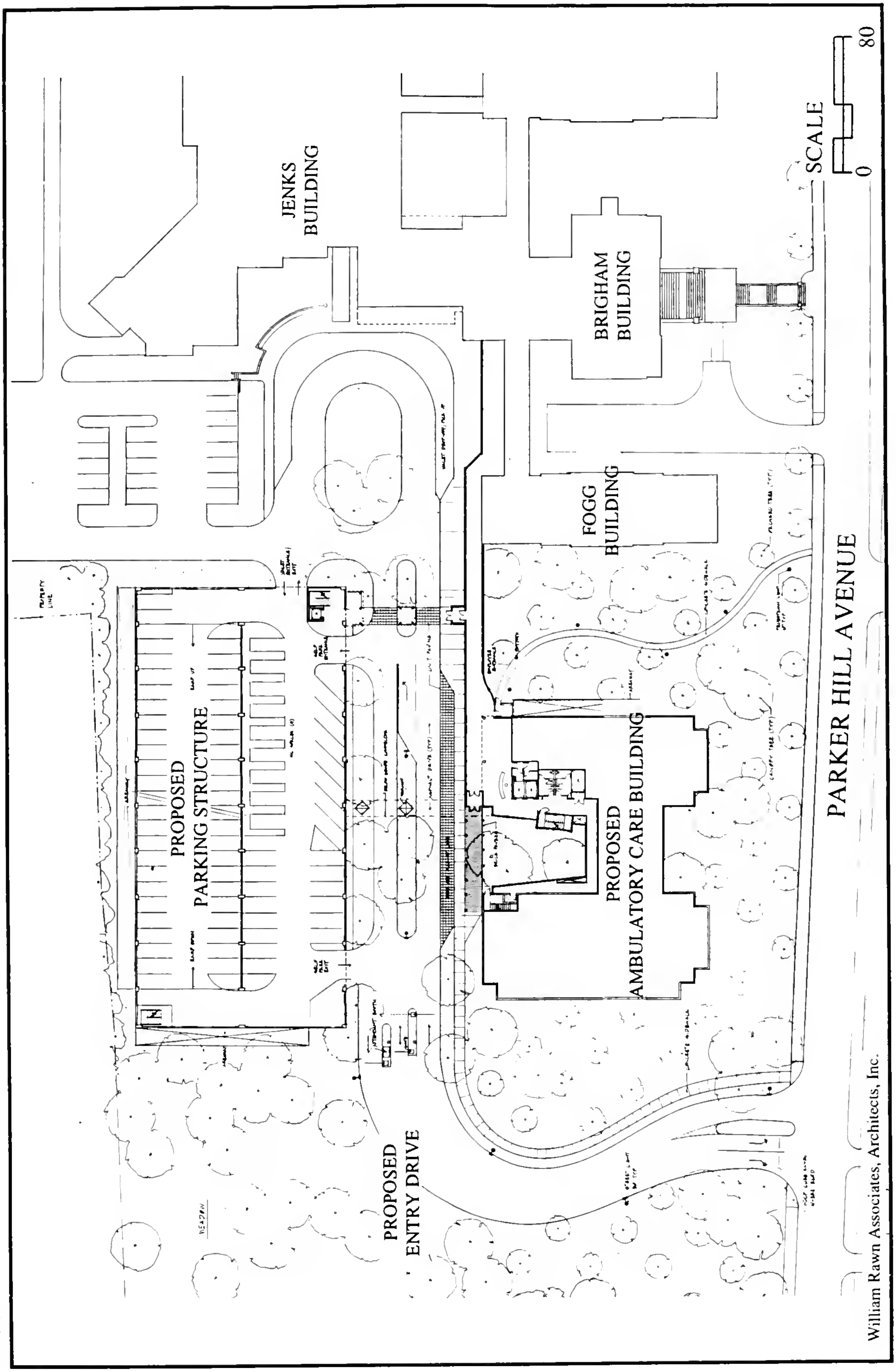

FIGURE V.1-2
SITE PLAN/AMBULATORY CARE BUILDING
& PARKING STRUCTURE

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Ambulatory Care Building. To accommodate the increased parking needs from the Ambulatory Care Building and increases in general Hospital business, the Hospital proposes to construct a new Parking Structure.

1.4 Program Elements

The major construction components of the proposed Project include the following:

- Ambulatory Care Building: 72,000 gsf, three levels plus one partially exposed basement level.
- Parking Structure: 1½ levels at grade or below-grade, 3 levels above-grade parking, 422 cars total.
- At-grade connector to main Hospital buildings: approximately 3,100 gsf.
- Below-grade connector from Ambulatory Care Building to Parking Structure: approximately 800 gsf.
- Landscape improvements to the meadow and the City of Boston's Fourth Tier of the McLaughlin Playground, and a new entry drive.

2.0 BUILDING DESIGN

The design of the proposed new Ambulatory Care Building, Parking Structure, entry drive and associated landscape improvements collectively respond to the following primary site conditions:

- The current entry courtyard, probably the best of any local hospital, is fundamentally a positive experience which should be reinforced.
- The entrance drive should enhance the experience of the open green area landscape as part of the Hospital entrance.
- From the entry court, there are extraordinary views to Jamaica Plain and Boston's southwest neighborhoods.
- From the proposed site for the Ambulatory Care Building, there are extraordinary views of downtown Boston.
- The relationship of total building mass to open space at the Hospital campus should be maintained.

2.1 Location of Buildings within Project Site

The Ambulatory Care Building is located on the Parker Hill Avenue side of the Project site to shield the Parking Structure from view along the main entry route to the Hospital. The new building has been carefully sited with respect to the Fogg Building to: 1) ensure privacy for exam rooms and offices in both buildings; 2) maintain the open views from the Fogg Building; and 3) maintain the rhythm of buildings and open spaces established along Parker Hill Avenue which is crucial to the character of the Hospital campus.

The Ambulatory Care Building is set back from Parker Hill Avenue to coincide with the setbacks established by existing Hospital buildings thereby assuring a more pleasant approach along Parker Hill Avenue. The Parking Structure and Ambulatory Care Building frame the edges of the new entry drive, creating a visual focus on the front door of the Hospital at the Jenks Building.

The Parking Structure's easternmost edge aligns approximately with an existing chain link fence which separates the Hospital's meadow from surface Parking Lot G. The Ambulatory Care Building is situated to the west of this line; thus, neither building protrudes into what is now open space east of the existing surface parking.

2.2 Building Massing

Ambulatory Care Building

The mass of the Ambulatory Care Building is strongly divided into two primary forms. This massing achieves three important objectives: 1) the scale of the new building closely reflects the scale of existing buildings on Parker Hill Avenue; 2) the perception of size and bulk of the building is considerably diminished in a manner consistent with the Parker Hill Avenue streetfront; and 3) the rhythm of facades and courtyards along Parker Hill Avenue is maintained. (See Figures V.1-3 and V.1-4 for eye level perspectives from Parker Hill Avenue.)

The Ambulatory Care Building will be three stories above existing grade. The existing grade along the north side of the building will be cut to allow natural light penetration into the basement level along the north side, making the building nearly four stories along the north facade. The total height of the building will be 51 feet above grade on the south facade and 60 feet on the north facade (see Figure V.1-5).

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FIGURE V.1-3
EYE-LEVEL PERSPECTIVE OF AMBULATORY CARE BUILDING

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FIGURE V.1-4
EYE-LEVEL PERSPECTIVE OF AMBULATORY CARE BUILDING
SITE ENTRY ON PARKER HILL AVENUE

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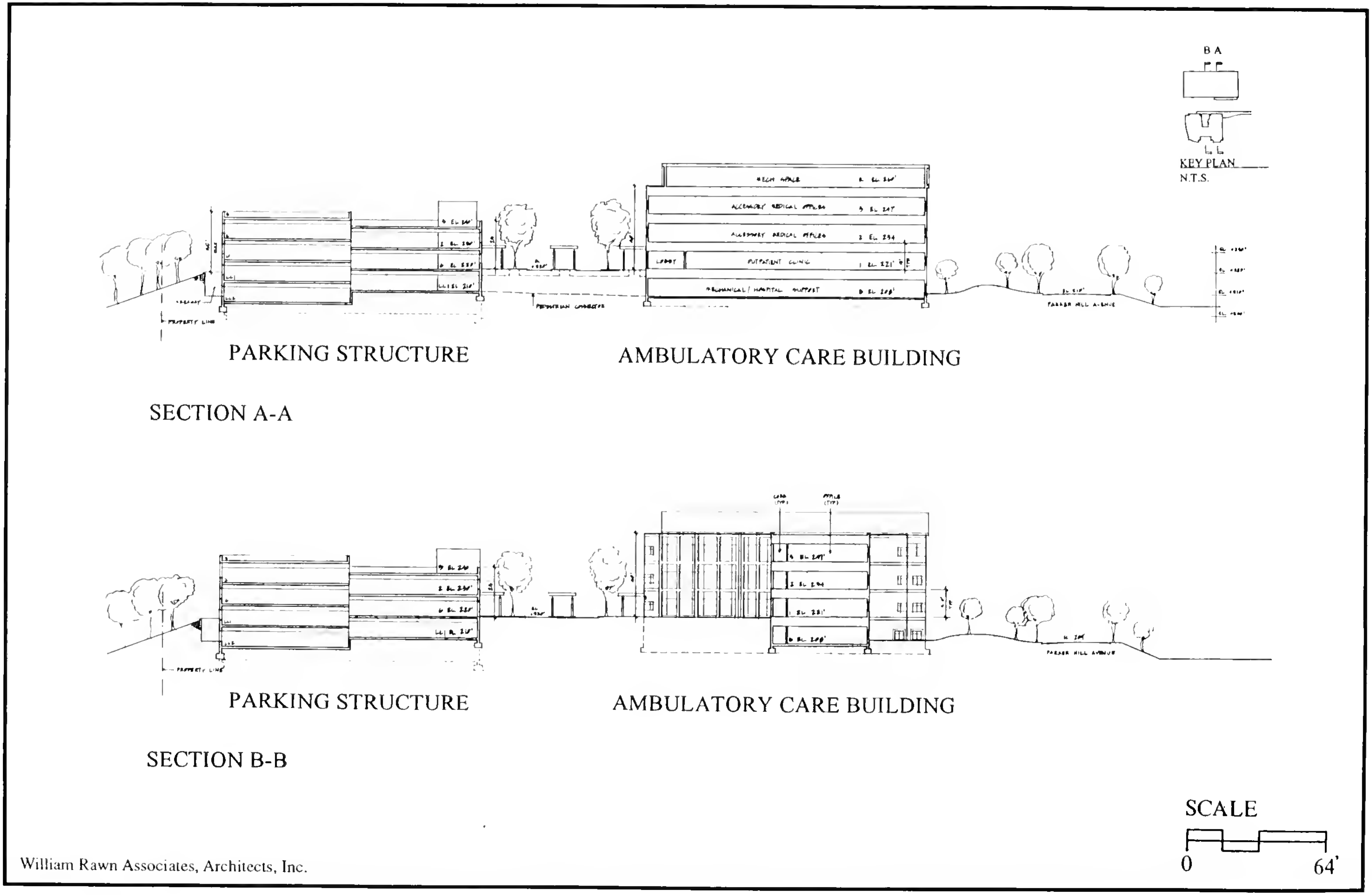

FIGURE V.1-5
AMBULATORY CARE BUILDING & PARKING STRUCTURE

Parking Structure

To minimize the visual impact of the Parking Structure from the existing Hospital buildings and Parker Hill Avenue, one and one-half levels of parking have been placed either below or at grade. The height of the Parking Structure parapets are 23 feet along its northern edge, and 35 feet (maximum) along its sloping southern edge. The increased elevation on the southern edge is due partly to a lower grade elevation on this side (215 feet versus 220 feet on the north side of the Parking Structure).

2.3 Building Character

Ambulatory Care Building

In keeping with the historic nature of building materials on the Hospital campus, the Ambulatory Care Building will have brick facades with stone highlight features (see Figures V.1-6 and V.1-7). The proposed floor-to-ceiling glazing in the courtyard of the Ambulatory Care Building will continue a tradition of fully-glazed hallways connecting buildings on the Hospital campus. The entrance canopy to the Ambulatory Care Building will serve as a protective cover for those entering the building, while enhancing the image of the Hospital as a bucolic, garden-like campus.

Parking Structure

The Parking Structure has been designed so that three of the four facades have flat or level floors behind them; the only sloping floors occur on the south facade which is not visible from Parker Hill Avenue and the meadow (see Figures V.1-8 and V.1-9). This assures that the visible facades will not look like parking structure walls but instead like garden walls or the walls of other Hospital structures. The Parking Structure will have brick facades on all four sides, with stone highlight features. While the south facade will appear one floor higher to abutters on Fisher Avenue, this side of the structure will be heavily landscaped and will also be at a minimum approximately 130 feet from the closest residence. The ground level parking layout is shown on Figure V.1-10.

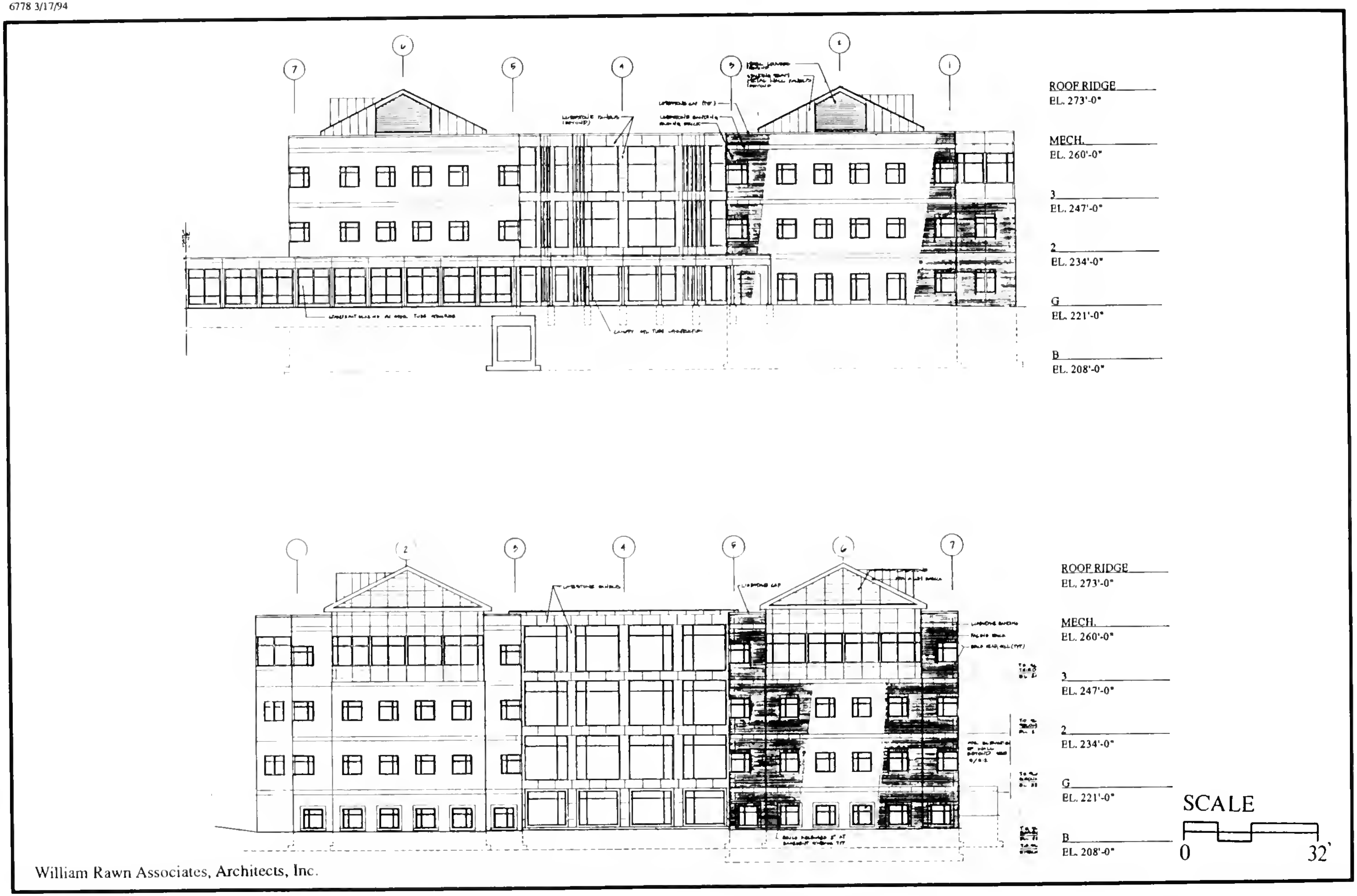

FIGURE V.1-6
SOUTH AND NORTH BUILDING ELEVATIONS
AMBULATORY CARE BUILDING

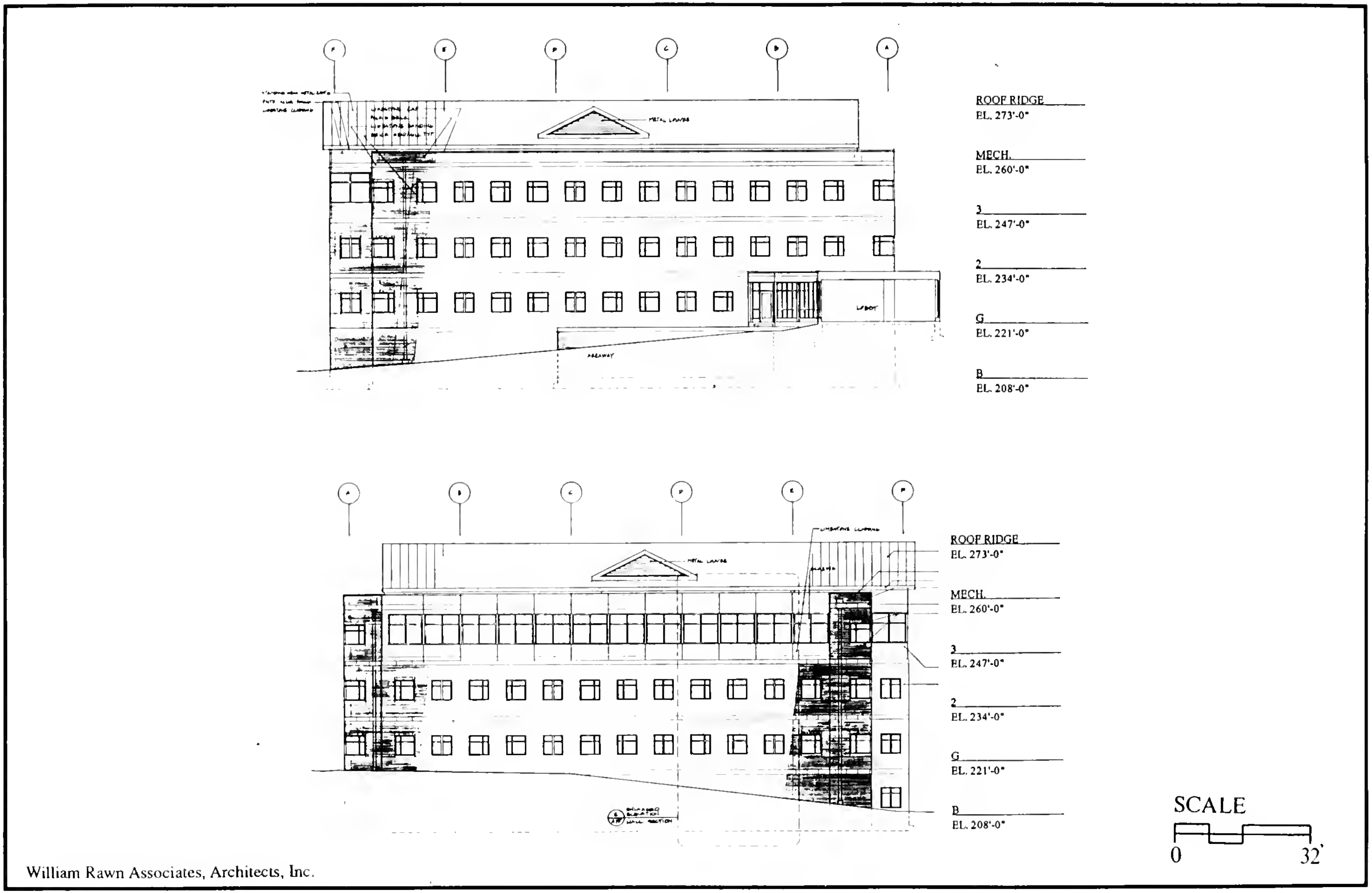

FIGURE V.1-7
WEST AND EAST BUILDING ELEVATIONS
AMBULATORY CARE BUILDING

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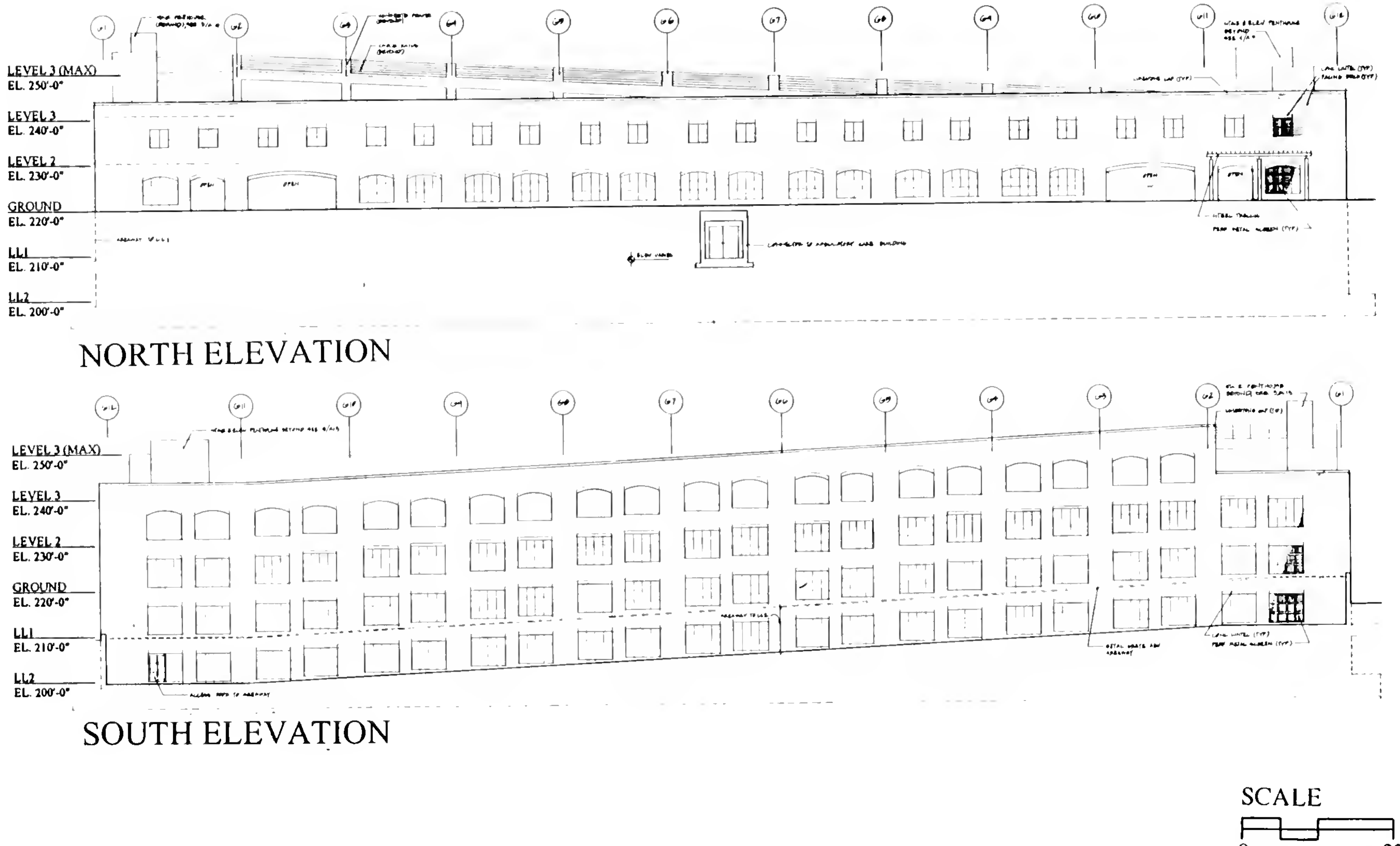

William Rawn Associates, Architects, Inc.

FIGURE V.I-8
NORTH AND SOUTH BUILDING ELEVATIONS
PARKING STRUCTURE

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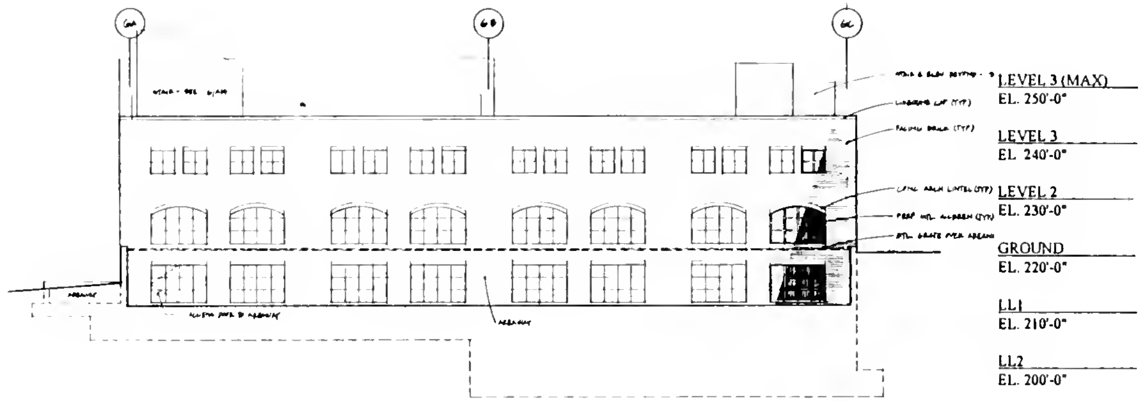
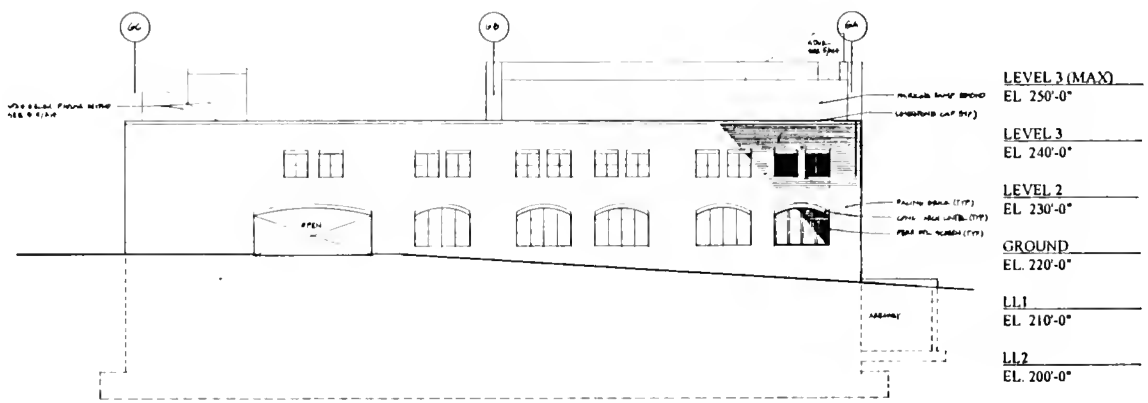


EAST ELEVATION



WEST ELEVATION

SCALE
0 32'

William Rawn Associates, Architects, Inc.

FIGURE V.1-9
EAST AND WEST ELEVATIONS
PARKING STRUCTURE

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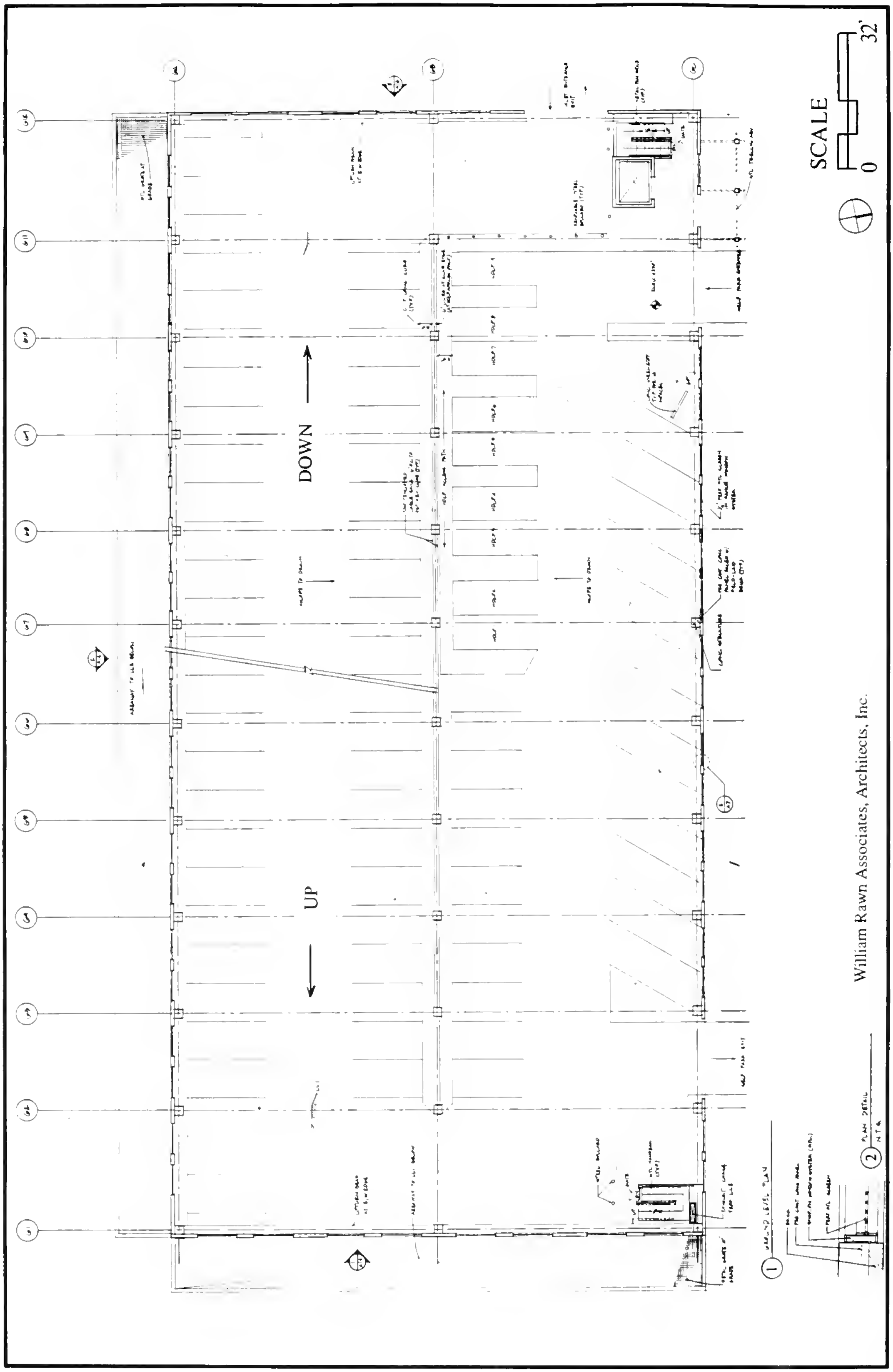

FIGURE V.1-10
GROUND LEVEL PARKING LAYOUT
PARKING STRUCTURE

2.4 Alternative Sites & Configurations

The Hospital has explored a number of options for locating and configuring the proposed Ambulatory Care Building and Parking Structure. The site is the only remaining open Hospital-owned property within the main Campus capable of accommodating structures of this size. Alternative configurations of the Ambulatory Care Building and Parking Structure on the Project site are shown in Figures V.1-11 through Figure V.1-13. All of these schemes were located on the undeveloped Hospital property east of the Fogg Building:

1) Extending the above-grade Parking Structure to include the existing surface lot adjacent to the Jenks Building, enclosing the south side of the entry courtyard (Figure V.1-11). This was rejected because the extended portion of the Parking Structure would block the dramatic views to the south and east from the entry courtyard. These views are fundamental to the positive experience of the current entry courtyard. Additionally the "L" parking structure scheme was functionally less efficient and would have blocked critical emergency access to the Fisher Avenue side of the Hospital.

2) Keeping the entry drive in its current location adjacent to the Fogg Building (Figure V.1-12). This was rejected because the drive would: A) sever the imperative at-grade enclosed link between the main Hospital and the Ambulatory Care Building; and B) dangerously congest automobile circulation to the Ambulatory Care Building, Parking Structure and main Hospital entry courtyard by forcing a vehicular conflict of left turns from two directions across pedestrian circulation, all at one intersection. Also, of fundamental importance is privacy to Hospital spaces; keeping the entry drive in its current location would compromise the privacy of exam rooms and offices in both the Ambulatory Care Building and the Fogg Building.

3) Locating the Ambulatory Care Building closer to the Fogg Building (Figure V.1-13). This alternative was not favored because:

   a. To preserve the quality of Parker Hill Avenue and the neighborhood, the Parking Structure is deliberately screened from the street by the Ambulatory Care Building;

   b. The distance between the proposed Ambulatory Care Building and the existing Fogg Building has been established in order to maintain minimum standards of visual privacy between physician office and exam rooms in each building, and maintain the views of downtown from Parker Hill;

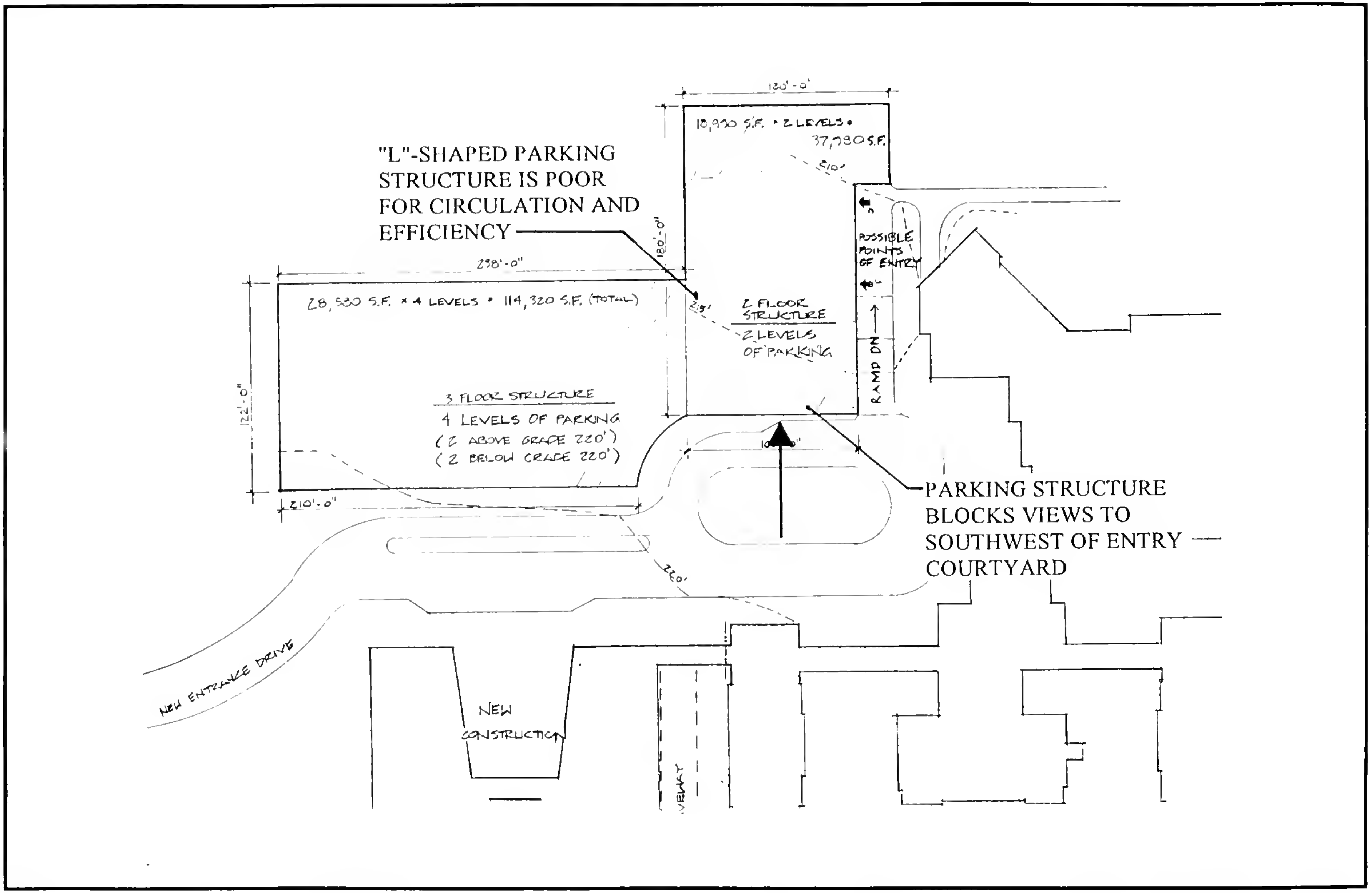

FIGURE V.I-11
EXTENDING PARKING STRUCTURE TO SURFACE
LOT ADJACENT TO JENKS BUILDING

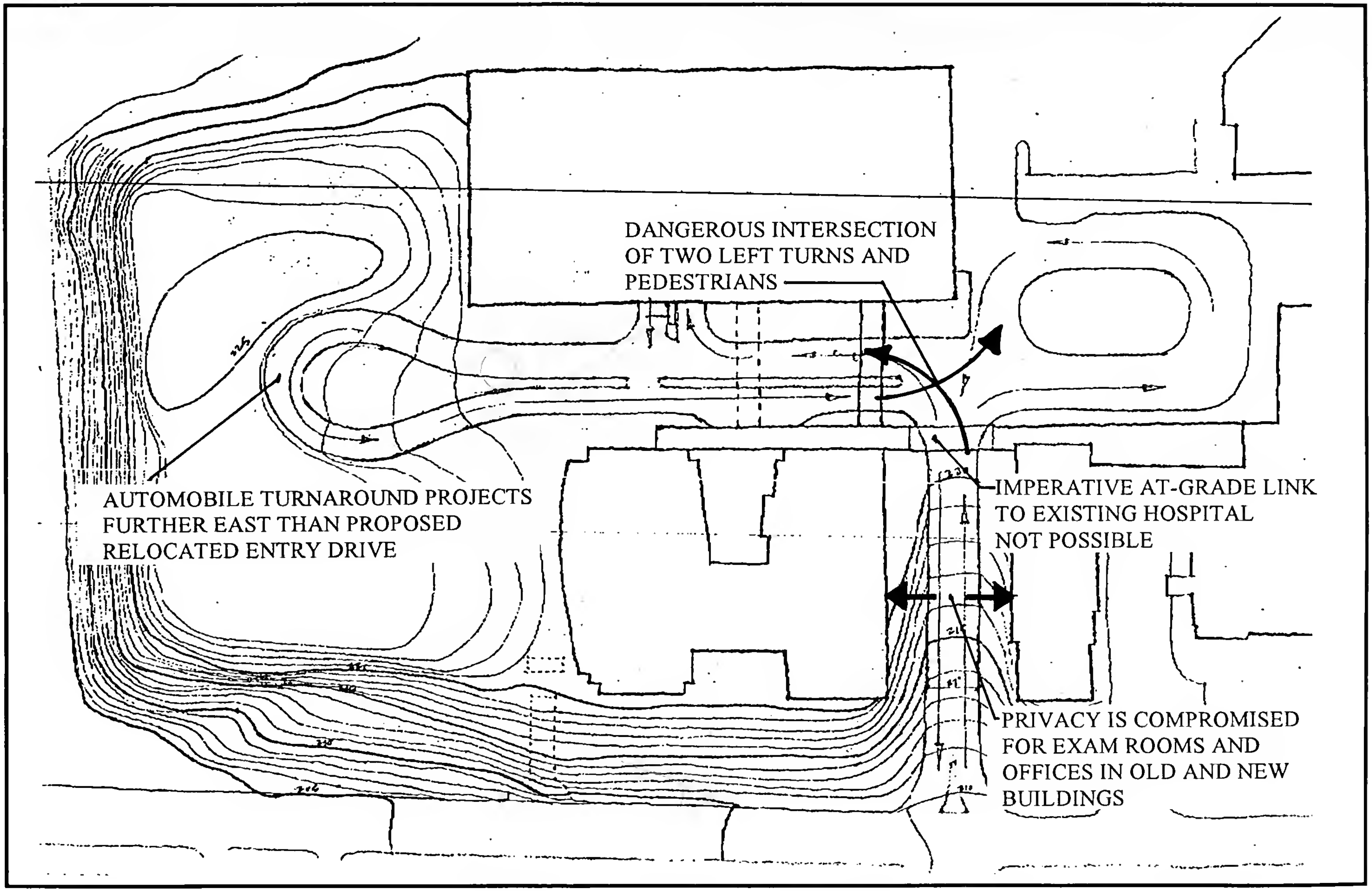

FIGURE V.1-12
MAINTAINING ENTRY DRIVE IN ITS CURRENT LOCATION

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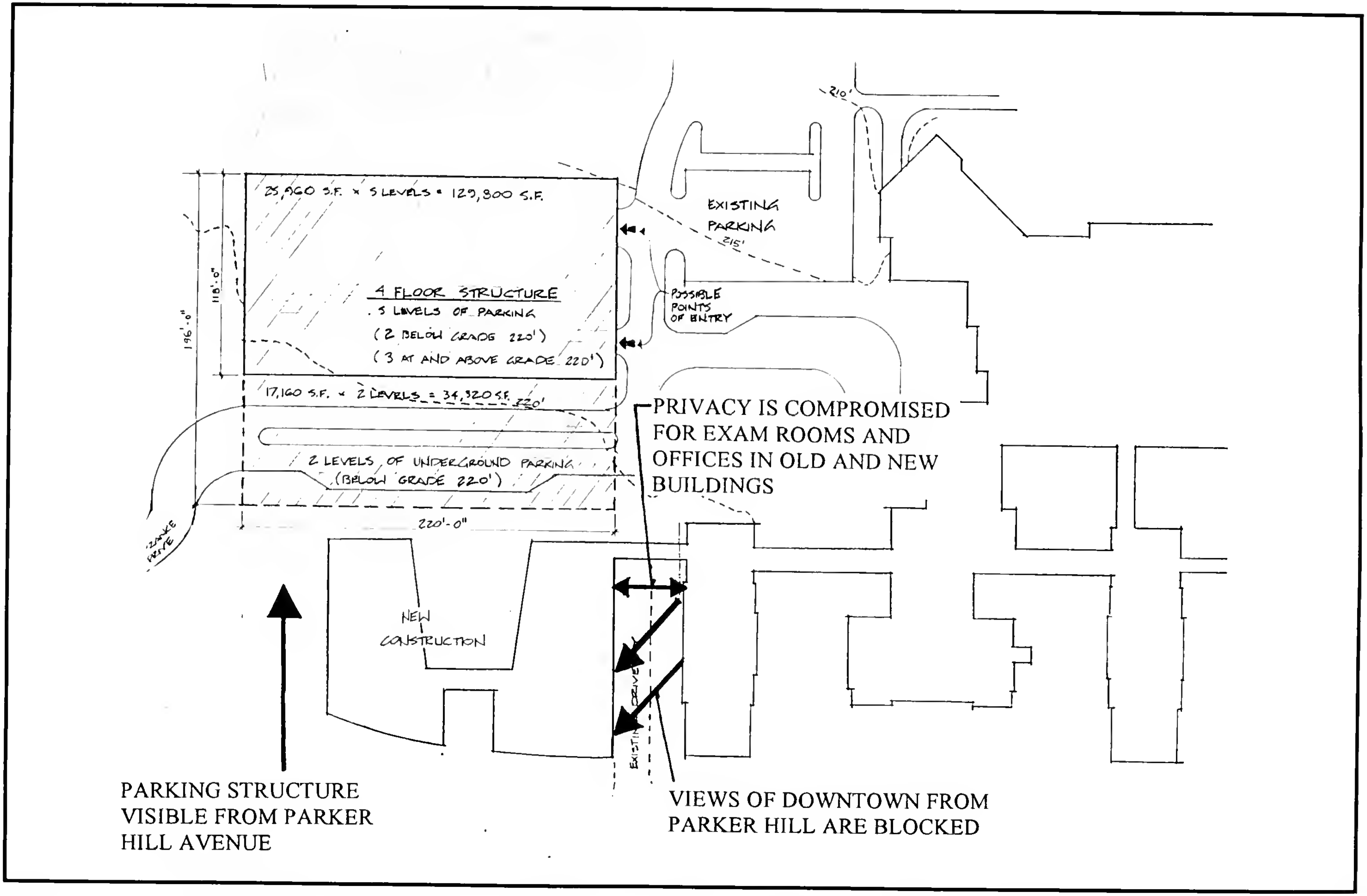

FIGURE V.1-13
LOCATING AMBULATORY CARE BUILDING
CLOSER TO FOGG BUILDING

c. The driveway entrance has been located in response to safety standards established by safe sight-line distances for automobiles entering and exiting the Hospital. Alternate drive locations west of the proposed point of entry were studied and shown to reduce safe sight distances.

3.0 NEW SITE ENTRY DRIVE AND LANDSCAPE

3.1 Site Entry Drive

The site entry drive to the new Ambulatory Care Building and Parking Structure will be located off Parker Hill Avenue immediately to the east of the two new structures. The drive will wind upslope at the edge of the existing meadow and enter the Hospital campus between the above structures, thereby affording access to the Hospital campus superior to the current entrance drive. The serpentine alignment of the drive, which will curve through the proposed orchard is consistent with the overall objectives of the Hospital's Open Space Landscape Master Plan (contained in the Master Plan and discussed below). These objectives include creating a more attractive, integrated and clear approach and entry to the Hospital's campus, while maintaining and enhancing open spaces within the Hospital's campus. The proposed orchard will be heavily landscaped to buffer the drive from the meadow and the Fourth Tier open space area.

3.2 Open Space Landscape

The Open Space Landscape Master Plan has been developed in response to the New England Baptist Hospital's spectacular location on top of Parker Hill, Boston's largest unaltered drumlin[1]. Parker Hill provides the Hospital with spectacular views stretching east from Boston Harbor to the westerly mountains of Massachusetts. The Landscape Master Plan, by its response to the Hospital campus' elegant oval shape drumlin stretching 2/3 of a mile in length and 1/4 of a mile in width, not only pays tribute to its rural past, but also celebrates this unique glacial phenomenon of New England's geological past.

The Landscape Master Plan discusses the meadow and Fourth Tier of the McLaughlin Playground and recalls the early open rural character of Parker Hill, known as "The Great Hill" in the late 17th, 18th, and early 19th centuries.

---

1 Bellevue Hill to the west, in Roslindale, is 40' higher at 260'. Parker Hill is 220', but of greater length and breadth.

The area was a farm estate, covered with apple orchards, grazing meadows, and wooded lots.

Today, the base and lower slopes of Parker Hill are covered with frame houses packed tightly on a close grid of streets. The summit of the hill to the north is partially occupied by the varied low-rise buildings of the Hospital and its adjacent parking. The rest of the summit to the south is open, a broad stretch of playgrounds, meadows, and wooded areas.

3.3 Project Landscape Improvements

A central focus of the Landscape Master Plan, which encompasses the entire Hospital campus, is the landscape improvements proposed for the area surrounding the new Ambulatory Care Building and Parking Structure (the meadow), and the Fourth Tier of McLaughlin Playground.

These improvements, which recall the early form and character of Parker Hill, include tree planting, extensive earth moving and reshaping of the land form, and the addition of pedestrian walkways near the summit.

The proposed tree-planting for the site comprises approximately 75 orchard trees spaced evenly on a traditional orchard grid, interspersed with 120 shade trees planted loosely in small groves and distributed across the site.

The proposed earth-moving consists of relocating approximately 40,000 cubic yards of fill excavated from the new Ambulatory Care Building and Parking Structure areas, to create a new five acre knoll. The knoll will heighten the present summit by 15 feet to a new elevation of 235 feet, and will extend the existing meadow on Hospital land to encompass the entire Fourth Tier of McLaughlin Playground. (See Figures V.1-14 & V.1-15 for landscape plan and plan of landscape modifications of existing grades.)

The newly created knoll will afford the opportunity for increased pedestrian connections from the lower playfields of McLaughlin Playground to the summit of Parker Hill, and from Fisher Avenue to Parker Hill Avenue. In addition, a pedestrian pathway connection between Parker Hill Avenue and Sachem Street along Oswald Street is proposed. Thus, the pedestrian walkway system on Parker Hill will be considerably improved and extended for community use by implementation of the Project landscape improvements.

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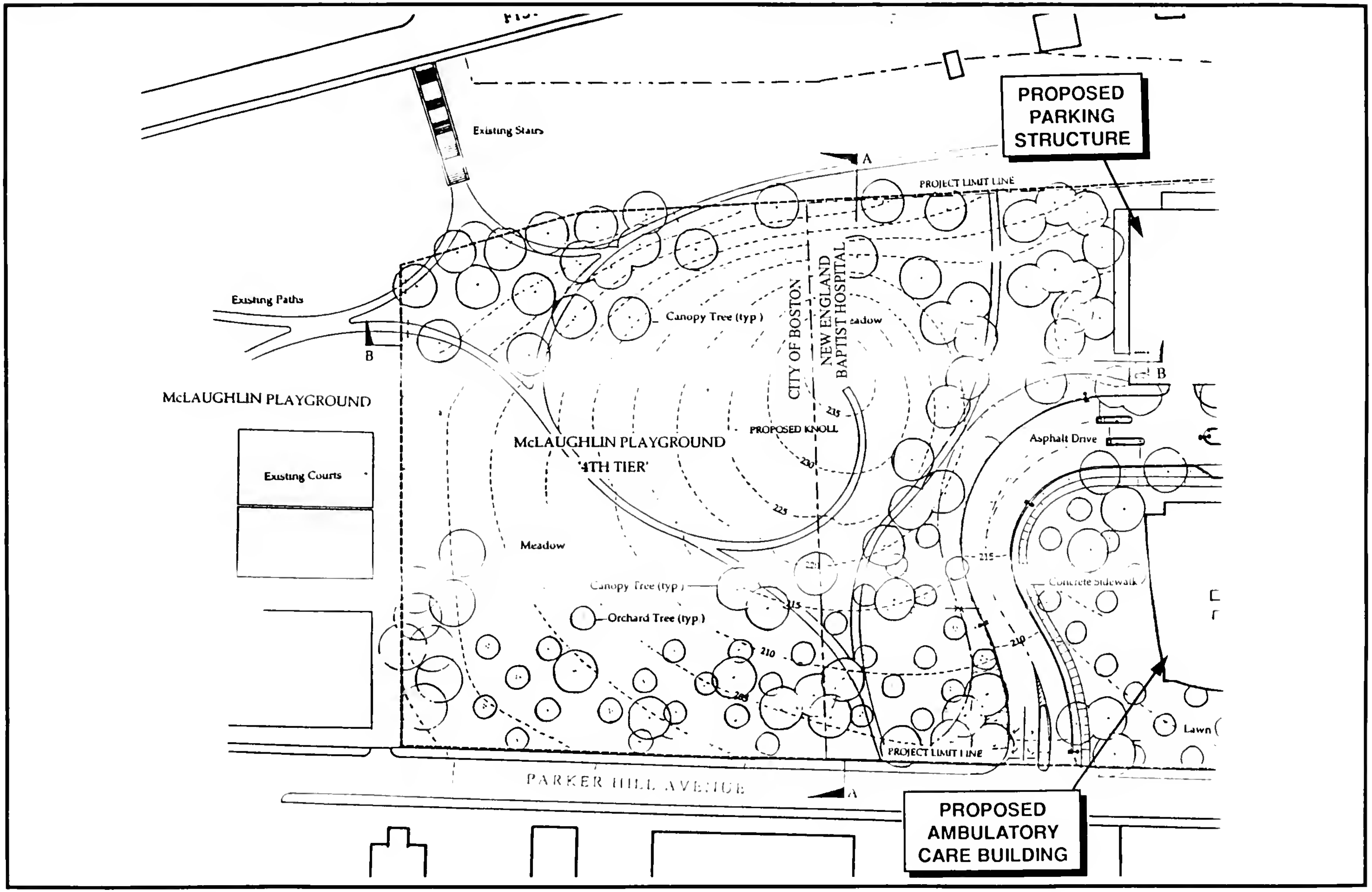

FIGURE V.1-14
PROPOSED LANDSCAPE PLAN

HMM Associates, Inc.

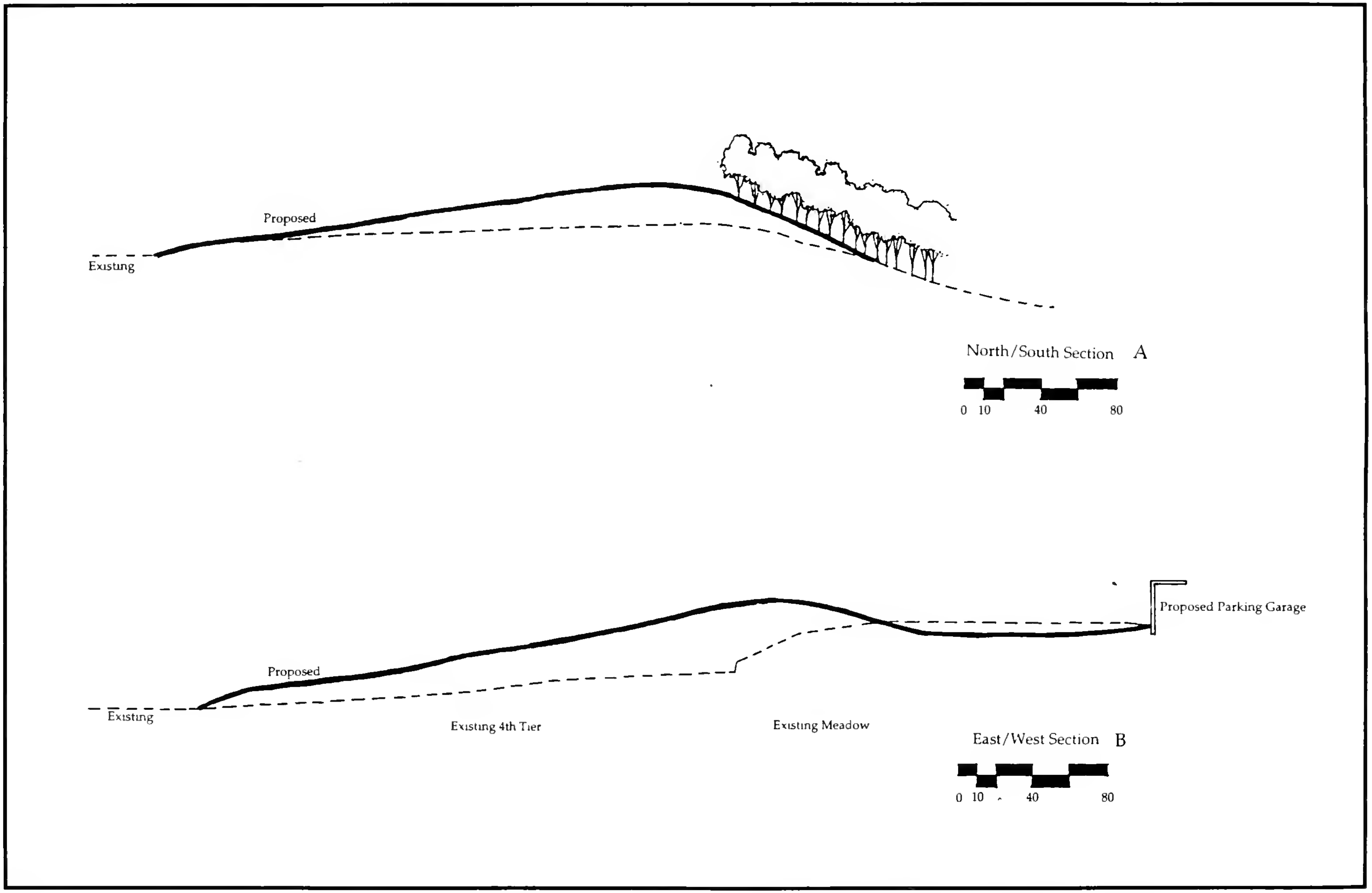

FIGURE V.1-15
LANDSCAPE MODIFICATIONS TO EXISTING GRADES
IN OPEN SPACE "MEADOW" & "FOURTH TIER" AREAS

4.0 RELATIONSHIP TO INSTITUTIONAL MASTER PLAN

The New England Baptist Hospital has prepared an Institutional Master Plan (IMP) which outlines how the services and facilities of the Hospital are likely to develop over the next five years. Eight program needs/proposed projects are listed in the IMP.

1) Ambulatory Care Building Parking Structure and Landscape Improvements;
2) Upgrading and Expansion of Inpatient Beds;
3) Outpatient/Ambulatory Services Space;
4) Parking: Improvements to lots north of Parker Hill Avenue and acquisition of a replacement satellite lot;
5) Landscape improvements to the Hospital campus and the Parker Hill Avenue streetscape;
6) New surgical suites;
7) New auditorium; and
8) New research facility.

The proposed Project described in this DPIR is meant to fulfill portions of selected needs listed in the IMP. Need #1) *Ambulatory Care Building,* will be entirely fulfilled by the Project. Need #4) *Parking,* will be partially fulfilled by the Parking Structure portion of the Project. Need #5) *Landscape Improvements,* will be partially fulfilled by the Project.

VI. HISTORIC RESOURCES COMPONENT

VI. HISTORIC RESOURCES COMPONENT

Files at the Boston Landmarks Commission (BLC) and the Massachusetts Historical Commission (MHC) were reviewed to identify historic resources in the Parker Hill/Mission Hill area. Historically and architecturally significant buildings and districts, as well as any known areas of archaeological significance in the Parker Hill/Mission Hill area were identified and are discussed below, as is the effect that the Project may have on them.

1.0 INVENTORY OF HISTORIC PROPERTIES IN THE PROJECT AREA

A review of BLC's and MHC's files was conducted to identify noteworthy buildings or districts in the Project vicinity: one building and one district were listed on the National Register of Historic Places. Figure VI.1-1 identifies the location of those resources. A brief description of those properties listed on the National Register follows. There are also ten districts and thirteen buildings in the Parker Hill/Mission Hill area which are eligible for various National Register designations.

1.1 National Register Districts

1.1.1 National Register District: Mission Hill Triangle District

The only district in the Parker Hill/Mission Hill area which is listed on the National Register of Historic Places is the Mission Hill Triangle District. This district, located about 1,500 feet to the north of the Project site, includes 54 row houses along Huntington Avenue, Smith Street, Worthington Street, Wigglesworth Street, and Tremont Street, most of which were built in 1872. This district is of particular interest as a substantially intact, attractive pocket of urban housing similar in style to contemporary Back Bay residential architecture, but scaled down and adapted for the development of a middle income neighborhood located just beyond the inner city. This district will be unaffected by the Project.

1.1.2 Districts Eligible for National Register Listing

There are ten districts in the Parker Hill/Mission Hill area which meet the criteria for National Register Listing:

- Blessed Sacrament Church District
- Mission Church District
- Ruggles Street/Parker Street District

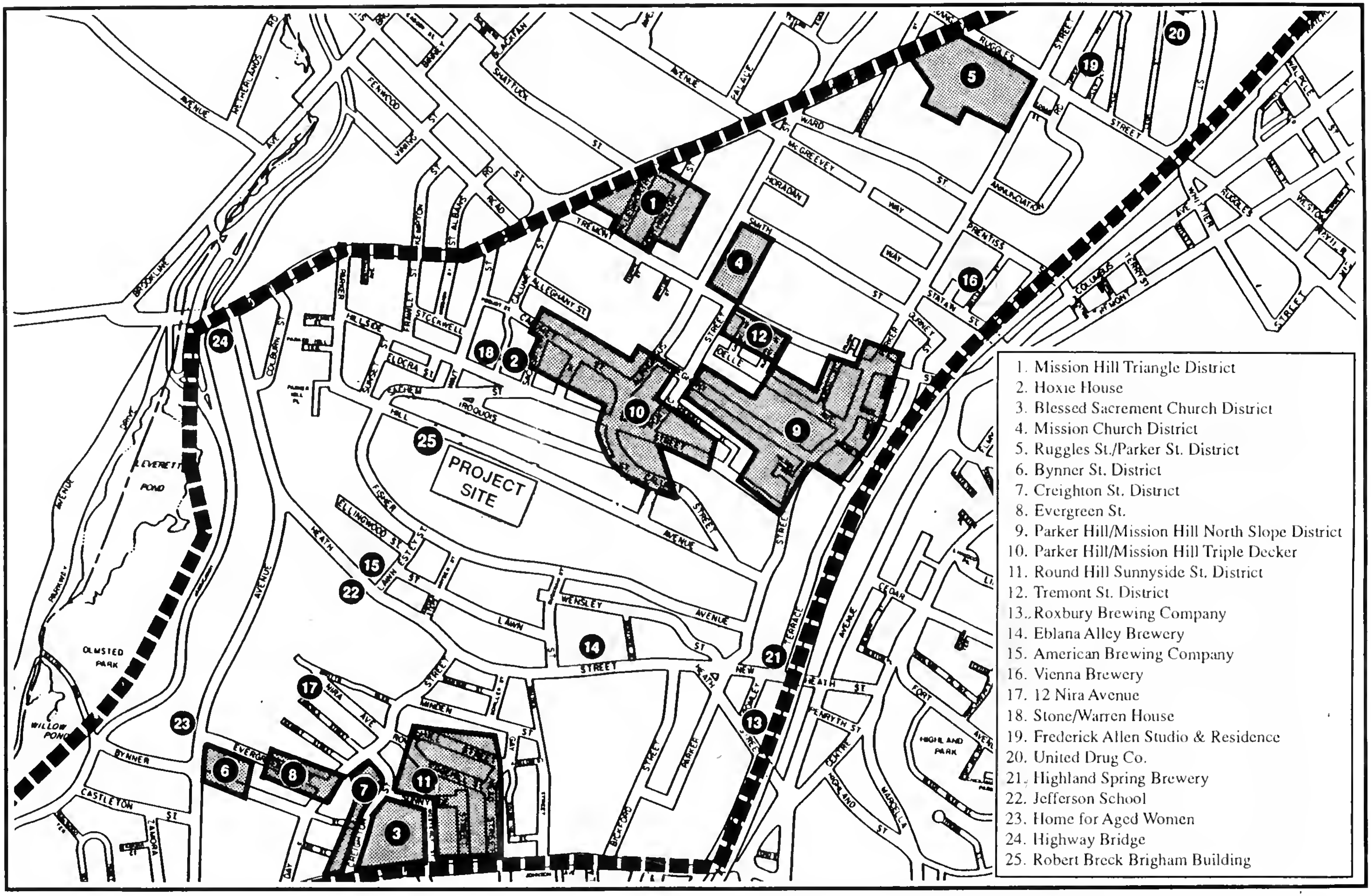

FIGURE VI.1-1
HISTORIC RESOURCES IN THE PARKER HILL/MISSION HILL AREA

- Bynner Street District
- Creighton Street District
- Evergreen Street District
- Parker Hill/Mission Hill North Slope District
- Parker Hill/Mission Hill Triple Decker District
- Round Hill Street/Sunnyside Street District
- Tremont Street District

1.2 National Register Buildings

1.2.1 National Register Building: Hoxie House (135 Hillside Street)

The only building in the Parker Hill/Mission Hill area which is listed on the National Register of Historic Places is the Hoxie House at 135 Hillside Street. This distinctive residential building, constructed in 1854, qualifies as an architecturally notable, relatively intact Italianate Villa and the only example of this style in the study area. It was built by Boston merchant Timothy Hoxie, and was moved across Hillside Street in the late 1880s. It is located about 600 feet north of the Project site, and will be unaffected by the Project.

1.2.2 Buildings Eligible for National Register Listing

There are thirteen individual properties in the Parker Hill/Mission Hill area which meet the criteria for National Register Listing:

- Robert Breck Brigham Hospital (125 Parker Hill Avenue)
- Roxbury Brewing Company (31 Heath Street)
- Eblana/Alley Brewery (117 and 123-125 Heath Street)
- American Brewing Company (249 Heath Street)
- Vienna Brewery (133 Halleck Street)
- 12 Nira Avenue
- Stone/Warren House (139 Hillside Street)
- Frederick W. Allen Studio and Residence (27 Tavern Road)
- United Drug Company (43 Leon Street)
- Highland Spring Brewery Bottling Plant and Warehouse (31 New Heath Street and 158-168 Terrace Street)
- Jefferson School (240 Heath Street)
- The Home for Aged Women (201-205 South Huntington Avenue)
- Highway Bridge (Huntington Avenue and the Riverway/Jamaicaway)

None of these properties will be impacted by the proposed project.

1.3 Other Historic Properties

The Boston Landmarks Commission study of Parker Hill/Mission Hill in 1985 identified two properties within the Hospital campus as being properties recommended for further study. These buildings include:

- Original New England Baptist Hospital Building (101 Parker Hill Avenue)
- Edward H. Haskell Home for Nurses (220 Fisher Avenue)

Neither of these properties will be impacted by the proposed Project.

2.0 EFFECTS OF THE PROJECT ON HISTORIC RESOURCES

2.1 Effects on Historic Resources

There are no National Register Buildings or Districts adjacent to the Project site. The nearest building listed on the National Register of Historic Places is the Hoxie House on Hillside Street, approximately 600 feet to the north of the Project site. The nearest district listed on the National Register is the Mission Hill Triangle District, located approximately 1,500 feet to the north of the Project site. Neither of these resources will be affected by the Project.

As discussed, the earlier BLC study identified ten districts and thirteen buildings in the Parker Hill/Mission Hill area which were eligible for National Register designation. Of these resources, the closest building to the Project site is the original Robert Breck Brigham Hospital building which is adjacent to the Project site. The closest district is the Parker Hill/Mission Hill Triple Decker District, located approximately 600 feet to the north and northeast of the Project site.

In determining whether the Project will adversely impact any of these historic resources, the following criteria were examined:

- Physical alteration of the resource;
- Non-conformity of the Project to the surroundings of the historic resource;
- Disruption of access to the historic resource; and
- Disruption of views of the historic resource.

An evaluation of the Project based on the above criteria indicates that none of these potentially historic resources will be impacted The original Robert Breck Brigham Hospital, which is closest to the Project site, will be provided an improved architectural setting by the new Project. The Ambulatory Care Building's height, setback, and footprint will be similar to that of this original

Hospital building, and will thereby strengthen its context along Parker Hill Avenue. The Project will also not affect access or views to the other historic properties previously identified in any way.

2.2 Design of the New Building

In keeping with the historic nature of building materials on the Hospital campus, the Ambulatory Care Building will have brick facades with stone highlight features. The proposed floor-to-ceiling glazing in the courtyard of the Ambulatory Care Building will continue a tradition of fully-glazed hallways connecting buildings on the Hospital campus. The materials of the Ambulatory Care Building, being brick facades with stone highlight features, picks up on the shape and materials of the Robert Breck Brigham Building and the original New England Baptist Hospital building which were identified for further study in the BLC's earlier document on Parker Hill/Mission Hill.

3.0 ARCHAEOLOGICAL RESOURCES

Based on research conducted at the office of the Massachusetts Historical Commission, there are no known archaeological resources within one-half mile of the site, and therefore the proposed Project is not anticipated to affect any archaeological resources.

A further review of historical materials* revealed that the City built a reservoir generally to the southeast of the Hospital's property in the latter half of the 19th century. The reservoir was removed before the Depression. During the Depression, the Joseph D. McLaughlin Playground was built on a portion of the former reservoir.

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* *The Historical Development of Mission Hill and its Open Space*, unpublished BRA report; *Boston's Open Space*, City of Boston, 1987; *1990 Boston Urban Wilds Report*, Boston Natural Areas Fund, 1990.

VII. INFRASTRUCTURE SYSTEMS COMPONENT

VII. INFRASTRUCTURE SYSTEMS COMPONENT

In this section, the effects of the Project on the following systems are addressed:

- Water Distribution System
- Sanitary Sewer & Storm Water System
- Energy Systems
- Communications

This section describes the existing systems, the effect of the Project on the physical configuration of the systems, and their capacity to serve the Project. To determine expected utility use levels for each infrastructure element, estimates have been prepared for increased demands associated with the Project.

The infrastructure analysis for the Project is primarily based on characteristic utility demand projections. All estimates for new levels of use assume full occupancy of the various project components.

1.0 WATER DISTRIBUTION SYSTEM

1.1 Description of Existing Facilities

Existing water service for domestic use and fire protection to the site is supplied from water systems owned and operated by the Boston Water and Sewer Commission (BWSC). Water is delivered through a gridded distribution system. These systems are designated as the Southern Low Service (SLS) System and the Southern High Service (SHS) System. The SLS is generally used to meet domestic water needs and street hydrant demand and the SHS is used as the main supply to the low pressure service system. However, because of the elevation of the Hospital facility area, only Southern High Pressure mains service the area. The 12-inch main that services the area was originally installed in 1892, and relined in 1981. No problems with water mains in the area have been identified by BWSC.

This water system is integrally connected to form loops which allow major water demands to be fed from more than one direction. This looping allows each system to function at optimum efficiency and provide a measure of safety and redundancy in the event of a water main break.

The BWSC water distribution system in the Project area is shown in Figure VII.1-1.

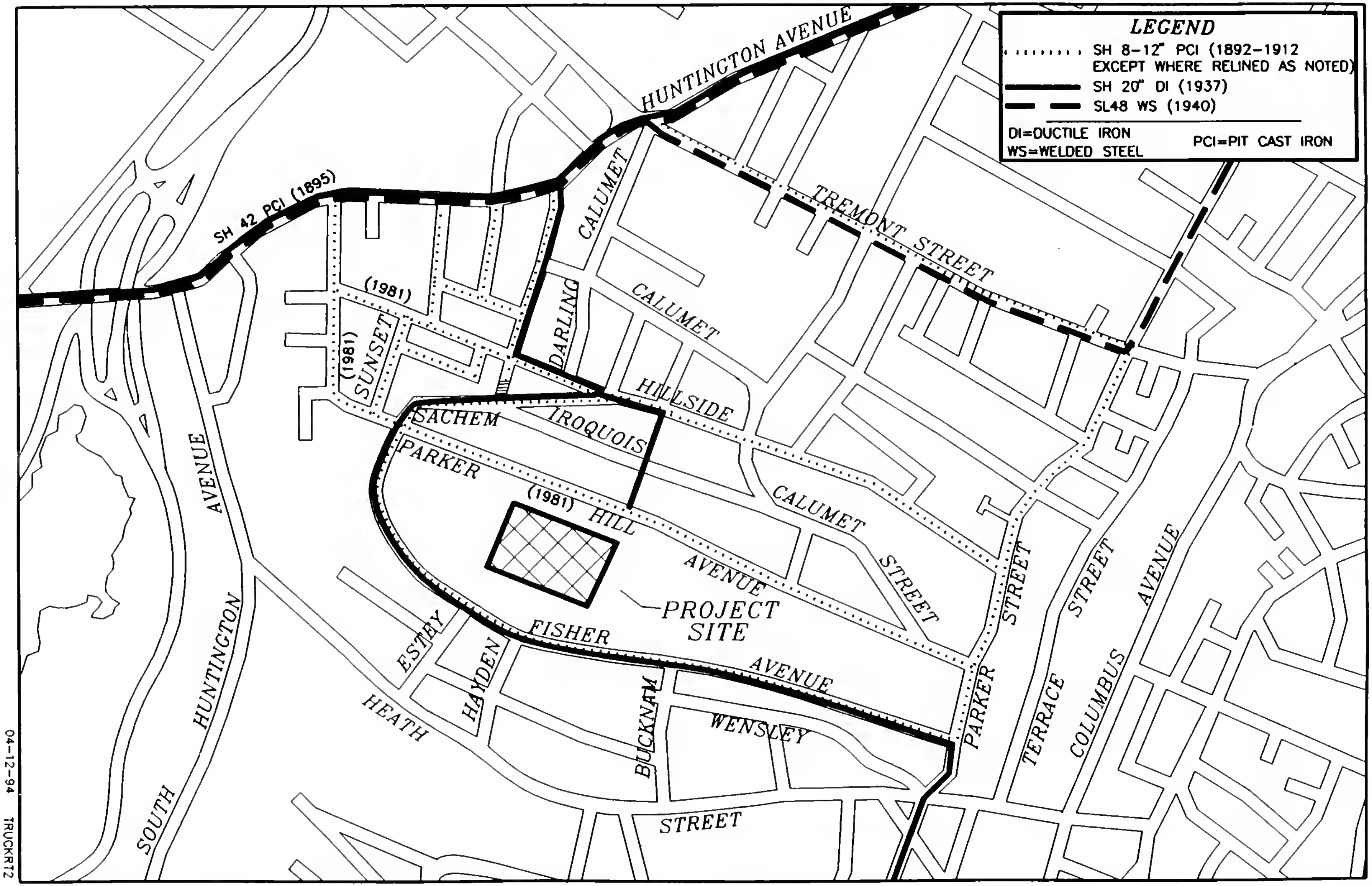

FIGURE VII.1-1
WATER DISTRIBUTION SYSTEM
NEW ENGLAND BAPTIST HOSPITAL

Hydrant tests (Table VII.1-1) in the vicinity of the Project site indicate that available system capacity ranges between 1210 gpm at 20 psi and 1424 gpm at 54 psi for the southern high pressure system servicing the Mission Hill area. A booster pump is located at the facility to maintain water pressure high enough to meet fire fighting requirements.

1.2 Project Water Demand and System Impacts

Domestic water demand for the new Ambulatory Care Building is estimated to average approximately 10,800 gallons per day (gpd). This estimate is based on actual water use data obtained from a similar medical and research facility rate of 200 gallons per 1,000 square feet of medical area. The peak flow rate for the Project is estimated to be 22.5 gallons per minute (gpm) based on a peaking factor of 3.

Process water use is estimated to average approximately 7,750 gpd and is limited to makeup water requirements for the cooling tower when the tower is in operation. The cooling tower is expected to be operated during moderate and warmer months of the year (roughly April through September) The tower's peak water consumption during operation is approximately 17,350 gpd (12 gpm) based on the evaporative heat content of water (12,000 btu/ton of refrigeration) and blowdown resulting from 5 cycles of concentration (typically 20% of total makeup water requirements).

Based on recent hydrant test data for the project vicinity, sufficient system capacity is available. BWSC has indicated that no system problems in the area have been identified and that sufficient capacity is available to meet project requirements.*

1.3 System Connections

Water service to the building will connect to an existing 6-inch pipe located in the Brigham Tunnel on the facility grounds through a duplex reduced pressure principle backflow (RPZ) backflow preventer, service valve and meter. No interruption to water service outside the campus is anticipated. No booster pump will be required beyond that currently on line at the Hospital facility.

* Based on a telephone conversation with Paul Keohane from BWSC March 21, 1994.

Table VII.1-1: Hydrant Flow Tests

Hydrant Test Location	Test Date	Static Pressure	Measured Flow at Residual Pressure	Calculated Flow at 20 psi Residual Pressure
Huntington St. between Colburn Street and Parker Hill Avenue 10" Southern Low	11/92	54 psi	3321 gpm at 43 psi	6108 gpm
Parker Hill Avenue past Hillside Street 12" Southern High	11/87	55 psi	1424 gpm at 54 psi	9710 gpm
Sachem at Parker Hill Avenue	10/87	21 psi	1210 gpm at 20 psi	1210 gpm

Source: Boston Water and Sewer Commission

The design and construction of all proposed service connections and system modifications will be performed to the standards of the BWSC and will be subject to their review and approval. Existing water connections and service to the area will be maintained during construction of the new facilities. Vehicular and pedestrian circulation in the area as well as streetscape improvements or park areas are not expected to be impacted by the system connections.

1.4 Water System Mitigation/Conservation Measures

All fixtures, equipment and materials shall be new, of a high grade commercial quality, and installed in accordance with the Massachusetts Plumbing and all local codes and requirements. The Project's design will incorporate provisions for water conservation, such as:

- 1.6 gallons per flush toilets;
- 1.0 gallons per flush urinals; and
- Flow restrictors for other plumbing fixtures.

Cooling tower use will be limited to periods where outside ambient temperature exceeds certain limits. In addition, when the temperature is low enough, draft fans will not be used in order to further reduce drift and evaporative losses and consumptive water use. In effect, at moderate temperatures, the cooling tower will act as a heat sink without the evaporative losses and makeup requirements normally associated with typical cooling tower operation.

2.0 SANITARY SEWER AND STORM WATER SYSTEM

2.1 Description of Existing Facilities

The site is currently served by separate BWSC sanitary and storm water sewers which discharge to the Deer Island Treatment Plant and the Muddy River, respectively. Figure VII.2-1 shows the routing of sanitary wastewater from the site to a main interceptor.

The existing facilities serving the site include a 12-inch sanitary sewer and a 12-inch storm drain.

The results of an evaluation of the capacity of the existing sewer facilities serving the site are shown on Table VII.2-1. The capacity of each sewer segment has been calculated based on the Manning Equation and sewer sizes, manhole invert elevations, and segment length data taken from the BWSC Wastewater System Maps.

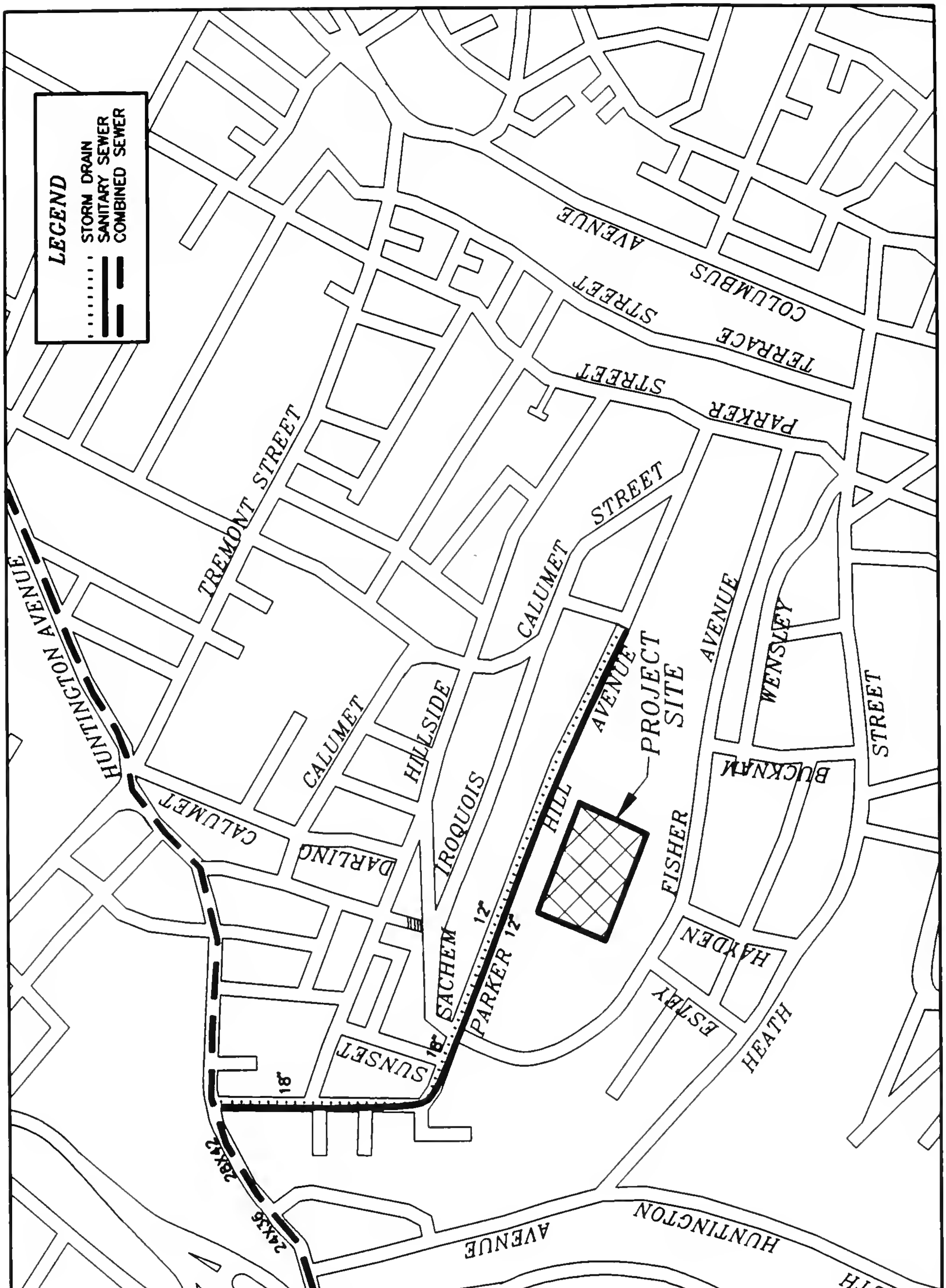

FIGURE VII.2-1
SANITARY AND STORM DRAIN SYSTEM
NEW ENGLAND BAPTIST HOSPITAL

Table VII.2-1: Sanitary Sewer Capacity

Manhole	Invert	Manhole	Invert	Pipe Diameter (in)	Length (ft)	Capacity (mgd)	Location
100	198.88	143	180.11	12	480	3.96	Parker Hill Avenue
143	180.11	183	139.13	12	585	5.30	Parker Hill Avenue
183	139.13	60	67.48	12	500	7.57	Parker Hill Avenue
60	67.48	12	29.43	15	350	10.27	Parker Hill Avenue
12	29.43	200	28.50	28x42	120	144.75	Huntington Avenue
200	28.50	29	26.14	28x42	380	37.80	Huntington Avenue
29	26.14	4	16.17	24x36	360	52.91	Huntington Avenue
4	16.17	3	11.68	24x31	190	40.99	Huntington Avenue
3	11.68	2	11.60	24x31	40	11.93	Huntington Avenue*

Source: Boston Water and Sewer Commission Maps 19G and 20G.

* This sewer segment flows under pressure. As a result, estimated capacity is significantly underestimated using Mannings equation.

BWSC has indicated that no problems are currently identified in the sewer lines currently serving the project area, and that sufficient available capacity exists in the sewer line for expected project discharges.*

2.2 Project Wastewater Generation

The majority of wastewater generated by the Project will be associated with sanitary uses. Average sanitary sewage generation for the Ambulatory Care Building is estimated to be approximately 9,720 gpd, based on a 10% reduction of the average water consumption estimates calculated for the Project. Peak sanitary discharge is expected to be approximately 20.25 gpm, based on a 10% reduction of the peak water consumption estimates calculated for the Project. Average process wastewater discharged to the sewer is estimated to be approximately 1,550 gpd, while peak process wastewater discharged to the sewer is expected to be approximately two gpm. These estimates are based on a cooling tower blowdown rate of approximately 20% to total makeup water requirements.

2.3 System Connections

Sanitary sewage connections will be made to the existing 12-inch sewer under Parker Hill Avenue via the existing connection located on the Hospital campus. The construction of all connections will be performed so as to minimize any effects on adjacent streets and to ensure that adequate facilities are available to service the site and surrounding area during construction.

The design and construction of all proposed service connections will be performed to the standards of the BWSC and will be subject to their review and approval. Existing sewer connections and service to the area will be maintained during construction of the new facilities. Vehicular and pedestrian circulation in the area as well as streetscape improvements or park areas are not expected to be impacted by the system connections.

2.4 Sewer System Mitigation

No chemical or biological waste will be discharged into the sewer system. Liquid entering into the sanitary drainage system will meet all standards for effluent discharges. Laboratory drainage systems will be equipped with automatic treatment systems to control pH and for metals removal where required. Treatment system specifications will be fully detailed in a subsequent filing for a Massachusetts DEP Major Sewer Connection Approval (Permit BWP IW 10).

* Based on a telephone conversation with Paul Keohane of BWSC on 3/18/94 and 3/21/94.

The Ambulatory Care Building will also meet all applicable code requirements for the installation of low flow fixtures, to minimize sewage generation. Use of low flow fixtures can reduce the projected water consumption and resultant sewage generation by up to 20%.

The design and construction of all proposed service connections and system modifications will be performed to the standards of the BWSC and will be subject to their review and approval.

Existing sewer connections and service to the area will be maintained during construction of the Project. If interruptions are necessary, they will be coordinated with the BWSC.

2.5 Storm Water Drainage

The site is served by a BWSC storm water drainage system, which discharges into the City's sewer system. Storm sewers adjacent to the site include a 12-inch storm drain as shown in Figure VII.2-1.

The existing on-site parking lot's storm water runoff currently drains into the area storm drainage system which eventually flows to the Muddy River. With construction of the Parking Structure, the quality of storm water runoff should improve due to the installation of controls in the garage areas. Clean rain water will be drained from the roof of the building. Storm water from the underground parking will be routed through a below grade gas/sand interceptor and explosion proof duplex ejector pump station into the BWSC gravity storm drainage system.

3.0 ENERGY SYSTEMS

3.1 Heating and Cooling Requirements

Heating for the Ambulatory Care Building will be provided by the existing Hospital boiler facility. Based on typical energy requirements for similar facilities, heating for the Project will total approximately 3.5 million BTU/hour.

Cooling requirements for the Ambulatory Care Building will be provided by a high efficiency centrifugal liquid type and are expected to be approximately 400 tons.

3.2 Electricity

The Hospital's existing power source (Boston Edison) will be used to provide power for the Project. It is estimated that an additional 560 kW of power

requirements will be imposed on the existing Hospital's primary electric source.

Main electric service will consist of new dual unground 13.8 kV primary electric service extended from the existing New England Baptist Hospital primary electric swichgear located in the existing boiler plant. A new duct will be extended from the existing primary electric service manhole located adjacent to the Jenks Buildings to a new unit substation in the Ambulatory Care Building.

The Hospital does not expect that this load will pose any problem to Boston Edison's available 13.8 kV power grid system.

3.3 Natural Gas

Gas for the Ambulatory Care Building will be provided via a 4-inch natural gas line. The connection will be made to the current system within the existing Hospital buildings. The existing Fisher Avenue Power Plant at the New England Baptist Hospital consists of three 25 MBtu/hour boilers fired by No. 4 fuel oil. Generally, one boiler is sufficient to meet present heating requirements. Heating requirements for the proposed facility are expected to be approximately 4 MBtu/hour.

3.4 Energy Conservation/Mitigation Measures

Energy conservation measures will be an integral part of the building design. Some of the measures to be incorporated into the building design are described below:

- High efficiency motors will be provided for motors operating 150 hours or more.
- Energy efficient fluorescent light fixture lamps and ballasts will be used for the Project facilities. Lighting will be installed in accordance with Massachusetts State Building Code Article 21, Energy Conservation.
- Windows will be fixed aluminum thermally broken systems with 1-inch tinted insulating glazing.
- The curtain wall will have 1-inch insulating glass with a ceramic foot at the courtyard level for shading purposes.

3.5 Communications

Communications (telephone) will be provided by the existing Hospital central telephone system. The Hospital has sufficient capacity within its in-house system to support the needs of the Project.

3.6 Fire Protection Systems

The Ambulatory Care Building will be protected with complete wet automatic sprinkler and Class III standpipe systems. These systems will feed off the existing fire protection system served by the Hospital Fire Pump via an 8-inch fire protection water service in the Brigham Tunnel located beneath the existing Hospital buildings.

The Parking Structure shall be protected with a complete dry automatic standpipe system throughout all levels. The lowest level shall be protected with a complete dry automatic sprinkler system. All fire protection equipment will meet Massachusetts Buildings codes, National Fire Protection Act requirements, local fire department, and all other local codes and requirements.

APPENDIX A

BRA Scoping Determination

Boston
Redevelopment
Authority

Clarence J. Jones, Chairman
Paul L. Barrett, Director

January 20, 1994

Mr. Gary E. Reed
Vice President, Support Services
New England Baptist Hospital
125 Parker Hill Avenue
Boston, MA 02120

Dear Mr. Reed:

Re: Ambulatory Care Building and Parking Structure Project

Please find enclosed the Scoping Determination for the New England Baptist Hospital Ambulatory Care Building and Parking Structure Project (the "Proposed Project"). The Scoping Determination describes information required by the Boston Redevelopment Authority in response to the Project Notification Form which you voluntarily submitted on December 9, 1993 pursuant to Article 31 of the Boston Zoning Code.

New England Baptist Hospital is also required to prepare and gain approval of an Institutional Master Plan (IMP), pursuant to Article 27M of the Code, as a condition for receiving an Interim Planning Permit as well as relief from applicable requirements of the Underlying Zoning. Scoping of the IMP has taken place at several meetings with BRA staff and at a meeting on January 4, 1994 with the Mission Hill Planning and Zoning Advisory Committee. The review of the IMP, under Article 27M, and the review of the Proposed Project, under Article 31, will occur generally in an interrelated fashion and on a parallel schedule.

Additional information may be required during the course of review of the IMP and the Proposed Project. If you have any questions regarding the Scoping Determination or the review process, please contact me at 722-4300, extension 4387.

One City Hall Square
Boston, Massachusetts 02201-1007
Telephone (617) 722-4300
Fax (617) 367-5916

We look forward to working with you toward the successful completion of the Project.

Sincerely,

Beverley E. Johnson

Beverley Johnson
Assistant Director for Institutional
Planning and Development

Enclosure

SIPD/102.RPT
011894/2

BOSTON REDEVELOPMENT AUTHORITY

SCOPING DETERMINATION

NEW ENGLAND BAPTIST HOSPITAL
AMBULATORY CARE BUILDING AND PARKING STRUCTURE PROJECT

SUBMISSION REQUIREMENTS

FOR DRAFT PROJECT IMPACT REPORT (DPIR)

PROPOSED PROJECT: Ambulatory Care Building and Parking Structure

PROJECT LOCATION: 145 Parker Hill Avenue, Boston, Massachusetts 02120

APPLICANT: New England Baptist Hospital

PNF SUBMISSION DATE: December 9, 1993

The Boston Redevelopment Authority ("BRA") is issuing this Scoping Determination pursuant to Section 31-5 of the Boston Zoning Code (the "Code"). The applicant voluntarily filed a Project Notification Form ("PNF") on December 9, 1993. The Scoping Determination requests information required by the BRA for its review of the Proposed Project in connection with the following:

(a) Development Review pursuant to Article 31 of the Code;

(b) Recommendations to the Board of Appeal with respect to the Zoning relief pursuant to Article 6 of the Code and an IPOD permit pursuant to Article 27M of the Code for the Proposed Project;

(c) Review and approval of the New England Baptist Hospital Master Plan pursuant to Article 27M of the Code.

PREAMBLE

The BRA is reviewing the Proposed Project pursuant to multiple sections of the Code. The Proposed Project is being reviewed in voluntary compliance with Article 31, Development Review Requirements, which sets out a comprehensive procedure for project review and requires the BRA to review the design, transportation, environmental, and other impacts of proposed projects. Article 31 requires the

submission of a satisfactory Final Project Impact Report prior to the issuance of a building permit.

The PNF indicates that the Proposed Project is located in an H-2 District of the Code and will require a conditional use permit. Criteria to be met for approval of a conditional use permit are outlined in Article 6-3 of the Code.

The Proposed Project is also located in the Mission Hill Interim Planning Overlay District (IPOD) and therefore is subject to Article 27M of the Code. Article 27M requires the Proposed Project be granted an Interim Planning Permit. The criteria for issuance of an Interim Planning Permit by the Board of Appeal are described in Section 27M-21. Further, an Interim Planning Permit for the Proposed Project shall be granted only if the Proposed Project is in conformity with an Institutional Master Plan (IMP) which has been approved pursuant to Section 27M-13.

It is expected that the review process for the Proposed Project, under Article 31, and the review process of the IMP, under Article 27M, will generally occur in an interrelated and parallel fashion.

I. PROPOSED PROJECT DESCRIPTION

The New England Baptist Hospital is a not-for-profit, non-sectarian, acute care, tertiary referral hospital located at 125 Parker Hill Avenue in Boston's Mission Hill area. It is licensed by the Massachusetts Department of Public Health to operate 220 beds, including 190 medical/surgical beds, 10 intensive care beds, and 20 hospital-based rehabilitation and skilled nursing beds. As a tertiary referral facility, it is renowned for its treatment of complex conditions, especially orthopedics.

The Hospital's existing campus facilities include approximately 22 acres. The New England Baptist Hospital Master Plan has identified program needs for new medical offices, ambulatory care and additional parking. Over the past five years, the Hospital has experienced considerable demand by physicians for quality medical offices on the Hospital campus. The Hospital anticipates the need for forty additional offices over the next few years.

As is the case throughout the health care industry, ambulatory care at the Hospital has grown more rapidly than inpatient care. The Hospital, therefore, needs to develop clinical service areas dedicated to the ambulatory patient, and new medical offices which serve these patients. In order to meet the growing need for ambulatory care, the Hospital proposes to construct a new Ambulatory care Building and associated parking structure. The Proposed Project will also include site improvements, primarily along Parker Hill Avenue.

The new Ambulatory Care Building will be located in the undeveloped area to the east of the existing Fogg Building. This proposed site has the advantage of being adjacent

to the parking in Lot G, clear access to the Hospital and the potential for linkage with the main Hospital buildings.

The Ambulatory Care Building will include approximately 72,000 gross square feet (gsf) of clinical and accessory medical office and support space on four levels. Three levels will be above-grade and one level will be partially below-grade.

The trend toward ambulatory care services increases the demand for convenient parking. The Hospital is planning to address new parking demands by increasing the capacity of Lot G, by constructing a parking structure, and by continuing to have a multi-faceted parking management strategy and continued support of public transportation. The new Parking Structure will be on two levels below-grade and two and one-half levels above-grade, and will provide parking for approximately 435 vehicles. The new Parking Structure will replace 134 existing spaces in Lot G, resulting in a net gain of 301 spaces. By putting approximately half of the parking spaces at grade or below ground level, the visual impact of the parking structure will be dramatically reduced. The design will provide for both self-park and valet service.

As part of the Project, a new entry drive for the Hospital from Parker Hill Avenue will be established east of the proposed Ambulatory Care Building. This drive will curve around the building, where vehicles can then access the new Parking Structure or continue to the drop-off area at the existing main Hospital entrance. The current entrance drive will be removed and landscaped.

An important element of the Project is an underground connection between the proposed Parking Structure and the Ambulatory Care Building. The existing at-grade connection between the Brigham Building and the Fogg Building will be expanded and extended to meet the new Ambulatory Care Building. This will be a physical link as part of a unified circulation system between all the Hospital buildings, including the Parking Structure.

Conceptual landscaping plans for the Parker Hill Avenue and the Hospital land to the north of Parker Hill Avenue at Parking Lots D and F are currently being prepared. This landscaping effort will require removal of four vacant houses along Parker Hill Avenue. A vacant house at the corner of Sachem Street and Iroquois Street within the boundaries of Lot D will also be removed. The landscaping will include ornamental trees along Parker Hill Avenue. Restriping of the spaces in Lots D and F will also be completed. The resulting campus access will provide an attractive, integrated, and clear approach and entry to New England Baptist Hospital.

II. NEW ENGLAND BAPTIST HOSPITAL MASTER PLAN

The New England Baptist Hospital is required to prepare an Institutional Master Plan for approval by the Boston Redevelopment Authority as a condition of approval of the Proposed Project. The content of the IMP has been defined through a scoping

process which has included meetings by the project proponent with BRA staff and a meeting with the Mission Hill PZAC on January 4, 1994. The review of the Proposed Project will be coordinated with the review of the IMP.

In accordance with Article 27M, the Authority within five days of receipt of the IMP will publish notice of the submission, transmit a copy of the IMP to the Mission Hill PZAC for their review, and make copies of the IMP available to the public for review.

Within 60 days of such notice, public comments, including the comments of public agencies, shall be transmitted in writing to the Authority. The Mission Hill PZAC shall hold a public meeting to allow public review and comment on the IMP within sixty days of the first publication of notice of submission to the Mission Hill PZAC. Within 90 days of publication of such notice the Mission Hill PZAC shall submit a report and recommendations to the Authority regarding its review of the IMP. If the Mission Hill PZAC has not held a public meeting within 60 days of publication of such notice or made its recommendation within 90 days of such notice, the Authority may render its decision without such meeting having been held or such recommendation having been made.

Based on public comments, the Mission Hill PZAC's recommendation, and the BRA's review of the Applicant's IMP, the Authority after public hearing either shall approve the IMP, conditionally approve the IMP or disapprove the IMP. The Authority shall not approve the IMP unless it finds that (a) the IMP conforms to the general plan for the City as a whole; and (b) that, on balance, nothing in the IMP will be injurious to the neighborhood or otherwise detrimental to the public welfare.

Based on the January 4, 1994 meeting with the Mission Hill PZAC and informal meetings with the Authority, we are providing below the scope regarding open space issues for the New England Baptist IMP, understanding that additional comments or issues may arise during the public comment period.

NEW ENGLAND BAPTIST HOSPITAL: OPEN SPACE ISSUES TO BE ADDRESSED IN THE MASTER PLAN and ARTICLE 31 REVIEW.

1. The development plan for the Hospital should take into account the following open space goals for the district:

   a. Improve pedestrian path system

   b. Utilize open space as a cohesive planning element

   c. Provide for increased maintenance of vacant lots and pathways (beautification)

   d. Streetscape enhancement

e. Determine ownership and boundaries of paper streets

2. The Hospital should enter into a management and maintenance plan for their property and adjacent connections which are important to the hospital and the community. (See Hellenic College Agreement as an example). Properties to be included in this plan would be the urban wilds site, the proposed surface parking areas, and the pathways on and adjacent to the Hospital. Prior agreements concerning maintenance of open space areas (i.e., McGaughlin Playground) should be incorporated into the plan.

3. The Hospital has indicated a willingness to maintain the Meadow as passive open space and provide improvements to the site including landscaping, pedestrian pathways and other amenities. The hospital should indicate what formal arrangements it is willing to enter into to insure the long term protection of the site. Possibilities include conservation restrictions, open space zoning or an extension of the existing agreement.

4. Conservation Protection Subdistrict zoning for the Meadow is not appropriate if the Hospital is committed to maintaining the meadow as open space. The site could be zoned as an Urban Wild Open Space Subdistrict with the concurrence of the Hospital. This designation would provide stronger protection for the Meadow by preventing future hospital construction on the site while the open space zoning was in effect. The zoning could be changed through the amendment process in the future.

   A conservation restriction would probably offer the most protection short of giving the property to the city.

III. COMMUNITY REVIEW

Staff of the BRA will work with New England Baptist Hospital to insure that area residents are provided adequate opportunity and assistance in reviewing the Proposed Project and the Institutional Master Plan. Community participation in the review process will be lead by the Mission Hill Planning and Zoning Advisory Committee (PZAC).

IV. DEVELOPMENT REVIEW REQUIREMENTS - ARTICLE 31

In addition to full-size scale drawings, 15 copies of the bound DPIR containing all submission materials reduced to size 8½"x11", except where otherwise specified, must be submitted to the BRA. An adequate number of copies must also be available for community review.

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A. GENERAL INFORMATION

1. Applicant Information

a. Development Team

(1) Names

(a) Developer (including description of development entity and type of corporation)
(b) Attorney
(c) Project consultants

a. Legal Information

(1) Legal judgments or actions pending concerning the proposed Project.

(2) Evidence of site control over the project area, including current ownership and purchase options of all parcels in the proposed project, all restrictive covenants and contractual restrictions affecting the proponent's right or ability to accomplish the proposed project and the nature of the agreements for securing parcels not owned by the prospective developer.

(3) Nature and extent of any and all public easements into, through, or surrounding the site.

2. Financial Information (See Appendix 1 for required financial information)

a. Full disclosure of names and addresses of financially involved participants and bank references.

b. Development Pro Forma

3. Project Area

a. Description of metes and bounds of project area or certified survey of project area.

4. Public Benefits

a. Adjustment in tax revenues, specifying existing and estimated future Payment in Lieu of Taxes (Pilot).

b. Housing and Jobs Linkage Payments

c. Anticipated employment levels including the following:

(1) Estimated number of construction jobs
(2) Estimated number of permanent jobs

d. Other public benefits, if any, to be provided.

5. Regulatory Controls and Permits

a. Existing zoning requirements, zoning computation forms, and any anticipated requests for zoning relief should be explained. A copy of the BRA's Scoping Determination should be included in the DPIR so that reviewers may know what was required.

b. Anticipated permits required from other local, state, and federal entities with a proposed application schedule should be noted.

c. If the Proposed Project becomes subject to the Massachusetts Environmental Policy Act (MEPA), required documentation should be provided including copies of the Environmental Notification Form and a proposed schedule for coordination with BRA procedure.

6. Community Groups

a. Names and addresses of project area owners, displacees, abutters, and also any community groups which, in the opinion of the applicant, may be substantially interested in or affected by the Proposed Project.

b. A list of meetings proposed and held with interested parties.

B. TRANSPORTATION COMPONENT

A Transportation Access Plan shall be prepared as defined by the Access Plan Scope outlined in Appendix 2. The Access Plan Scope will apply to both the transportation management component of the Institutional Master Plan, as well as to the Proposed Project.

C. ENVIRONMENTAL PROTECTION COMPONENT

1. Wind

A qualitative analysis of the potential wind impacts of the proposed project at the pedestrian level shall be required for the Draft Project Impact Report. This analysis shall determine potential pedestrian level winds adjacent to and in the vicinity of the project site and shall identify any areas where wind velocities are expected to exceed acceptable levels, including the Authority's guideline of an effective gust velocity of 31 mph not to be exceeded more than 1% of the time.

Areas of interest for the analysis shall include public and other areas of pedestrian use, including, but not limited to, entrances to the project buildings, sidewalks and pedestrian walkways adjacent to and in the vicinity of the project building, and open space areas in the vicinity of the project development, including Joslin Park.

For areas where wind speeds are projected to exceed acceptable levels, measures to reduce wind speeds and to mitigate potential adverse impact shall be identified.

Should the qualitative analysis indicate the possibility of excessive pedestrian level wind speeds, additional studies, including wind tunnel testing, may be required for the Final Project Impact Report.

2. Air Quality

A future air quality (carbon monoxide) analysis shall be required for any intersection where level of service is expected to deteriorate to D and the project causes a 10 percent increase in traffic or where the level of service is E or F and the project contributes to a reduction of LOS. The methodology and parameters of the traffic-related air quality analysis shall be approved in advance by the Massachusetts Department of Environmental Protection and the Boston Redevelopment Authority. Mitigation measures to eliminate or avoid any violation of air quality standards shall be described.

A description of the parking garage exhaust system (if a mechanical system is proposed), including location of intake and exhaust vents and specifications, and an analysis of the impact on pedestrian level air quality from operation of the exhaust systems shall be required.

3. Solid and Hazardous Wastes

The DPIR shall describe the generation, storage, and disposal of all solid wastes from the operation of the proposed project. The DPIR shall identify the specific nature of the wastes to be generated and shall estimate the quantities of such wastes. The generation of any hazardous wastes also shall be described and evaluated.

4. Noise

An analysis of the potential noise impacts from the project's mechanical and exhaust systems and compliance with applicable regulations of the City of Boston shall be required. A description of the project's mechanical and exhaust systems and their location shall be included. Measures to minimize and eliminate adverse noise impacts on nearby sensitive receptors shall be described.

5. Geotechnical Impact

An analysis of existing sub-soil conditions, groundwater levels, potential for ground movement and settlement during excavation, and potential impact on adjacent buildings and utility lines shall be required. This analysis shall also include a description of the foundation construction methodology, the amount and method of excavation, disposal of the excavate, and measures to prevent any adverse effects on adjacent buildings and utility lines.

Measures to ensure that groundwater levels will not be lowered during or after construction also shall be described.

6. Construction Impacts

A construction impact analysis shall include a description and evaluation of the following:

a. potential dust and pollutant emissions and mitigation measures to control these emissions and to avoid adverse impacts on pedestrians, hospital patients, and visitors to the area.

b. potential noise impact and mitigation measures to minimize increase in noise levels and to avoid adverse impacts on pedestrians, hospital patients, and visitors to the area.

c. location of construction staging areas and construction worker parking.

d. construction schedule, including hours of construction activity.

e. access routes for construction trucks and anticipated volume of construction truck traffic.

f. method of demolition of the existing building on site, control of emissions, asbestos removal, and disposal of demolition waste, including identification of disposal site.

g. generation and disposal of construction debris.

h. potential for the recycling of demolition debris from the site.

i. impact of project construction on rodent populations and description of the proposed rodent control program, including frequency of application and compliance with applicable City and State regulatory requirements.

j. measures to protect the public safety.

D. URBAN DESIGN COMPONENT

1. Design Considerations

The prominent location of the proposed project requires special attention to the following factors:

a. The entrance drive should enhance the meadow landscape by emphasizing the hilltop form and exceptional city views.

b. The ambulatory care building massing and facade design should acknowledge both the residential scale of the surrounding neighborhood and the hilltop location with its vistas.

c. The project should include streetscape improvements to both sides of Parker Hill Avenue with special attention to the existing loading dock at the Lahey Building.

d. Proponents should study the feasibility of increasing the amount of parking land at Lot F adjacent to the sidewalk and reducing the visibility of the parking lot from Parker Hill Avenue.

2. Submission Requirements

a. Written description of program elements and space allocation for each element.

b. Plan and sections for the surrounding area and district and sections at an appropriate scale (1"=40' or larger) showing relationships of the Proposed Project to the surrounding area and district:

- massing
- building height
- open space
- major topographic features
- pedestrian and vehicular circulation
- land use

c. Black and white 8"x10" photographs of the site and neighborhood.

d. Sketches and diagrams of alternative proposals to clarify design issues and massing options.

e. Eye-level perspective (reproducible line drawings) showing the proposal in the context of the surrounding area.

f. Aerial views of the project.

g. Site plan and sections at 1"-20' or larger showing relationships to adjacent buildings and spaces:

- general relationships of proposed and existing adjacent buildings and open spaces

- open spaces defined by buildings on adjacent parcels and across streets

- general location of pedestrian ways, driveways, parking, service areas, streets, and major landscape features

- pedestrian, handicapped, vehicular and service access and flow through the parcel and to adjacent areas

- phasing possibilities clearly indicating the scheme for completing the improvements

- construction limits

h. Massing model at 1"-100' showing all buildings in the area and a study model at 1"-16' showing facade design.

i. Drawings at an appropriate scale (e.g., 1"=8') describing architectural massing, facade design and proposed materials including:

- building and site improvement plans
- elevations in the context of the surrounding area
- sections showing organization of functions and spaces
- preliminary building plans showing ground floor and typical upper floor(s)

j. A site survey at 1"=40'-0" showing nearby structures, utilities and bench marks.

k. Proposed schedule for submittal of design development materials.

Submission materials for Design Development and Contract Documents submissions can be found in Appendix 3.

E. HISTORIC RESOURCES COMPONENT

An historic resource analysis must assess the impacts of the Proposed Project's height, scale, massing, and other relevant environmental factors on any historic districts or buildings in the vicinity of the Proposed Project. The DPIR must also assess the potential presence of any archaeological resources which may be affected by the construction of the Proposed Project or the IMP.

F. INFRASTRUCTURE SYSTEMS COMPONENT

An infrastructure impact analysis must be performed. The discussion of Proposed Project impacts on infrastructure systems should be organized system-by-system as suggested below. The applicant's submission must include an evaluation of the Proposed Project's impact on the capacity and adequacy of existing water, sewerage, energy (including gas and steam), and electrical communications (including telephone, fire alarm, computer, cable, etc.) utility systems, and the need reasonably attributable to the Proposed Project for additional systems facilities.

Any system upgrading or connection requiring a significant public or utility investment, creating a significant disruption in vehicular or pedestrian circulation, or affecting any public or neighborhood park or streetscape improvements, comprises an impact which must be mitigated. The DPIR must describe anticipated impacts in this regard,

including specific mitigation measures, and must include nearby Proposed Project and applicable Master Plan buildout figures in the analysis. Communications with utilities should be documented.

The location and configuration of connections (existing vs. new, etc.) should be documented. The analysis of the project's infrastructure system impacts should be conducted with specific regard to total projected demand on those systems (i.e., where possible, express projected project needs as a percentage of available system capacity where figures are available.) Information regarding control of potential contaminant discharge is requested.

1. Water and Sewer Systems

The Water and Sewer Systems Analysis must include the following:

a. Estimated water consumption and sewerage generation from the Proposed Project and the basis for each estimate. Include separate calculations for air conditioning system make-up water.

b. Description of the capacity and adequacy of water and sewer systems and an evaluation of the impacts of the Proposed Project on those systems. This evaluation should take into account the age of the system components adjacent to the site. Diagrams of the subject systems, showing proposed or existing connections, should be included.

c. Identification of measures to conserve resources, including any provisions for recycling.

d. Description of the Proposed Project's impacts on the water quality of the Muddy River or other water bodies that could be affected by the project. Include the impact of on-site storm drainage on water quality. Description of mitigation measures to reduce or eliminate impacts on water quality.

e. Brief description of fire protection system and connections, as well as other emergency systems.

Water supply systems adjacent to the project and servicing the project should be looped so as to minimize public hazard or inconvenience in the event of a main break.

2. Energy Systems

The Energy Systems Analysis must include the following:

a. Description of energy requirements of the project and evaluation of project impacts on resources and supply. Information is required regarding NEBH's existing plant's ability to supply electrical and thermal energy for project needs.

b. Description of measures to conserve energy usage and consideration of the feasibility of including solar energy provisions or other on-site energy provisions.

c. Detail the energy source of the interior space heating; how obtained, and, if applicable, plans for reuse of cooling system condensate.

d. Brief description of emergency power capabilities.

The location of transformer and other vaults required for electrical distribution or ventilation must be chosen to minimize disruption to pedestrian paths and public improvements both when operating normally and when being serviced, and must be described.

3. Other systems should be included in similar analyses when applicable: gas, steam, telephone, cable, fiberoptic communications, etc.

Note: Infrastructure impacts analysis for buildout occurring within an institution's Master Plan period should be required as an important component of Institutional Master Plans.

APPENDIX 1

REQUIRED FINANCIAL INFORMATION

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REQUIRED FINANCIAL INFORMATION
NEW ENGLAND BAPTIST HOSPITAL
PROPOSED PROJECT

DEVELOPMENT PRO FORMA includes all the information normally found in a development pro forma, by phase. This includes, but is not limited to:

- Land costs, per land square foot and total, by parcel, including any incremental disposition cost attributed to the project.
- Attribution of acquisition expense over project components (per FAR square foot, clinical, research, office, etc.).
- All hard costs on a per-unit and total basis by phase (disaggregated into base building, tenant improvement work, garage, site work, furniture, fixtures and equipment, FF&E, etc.).
- All soft costs on a per-unit and total basis (disaggregated into individual line items such as architectural, engineering, legal, accounting, and developer's fees, and any other professional fees, insurance, permits, real estate tax during construction, etc.).
- All contingencies, on a per-unit and total basis, by phase (specify whether contingency is on hard costs, soft cost, or total cost).
- All assumptions regarding financing terms on acquisition, pre-development, construction and permanent loans, by phase (including financing fees, interest rates, drawdown assumptions, terms, participations, amortization).
- Calculation of housing and jobs linkage obligations, and anticipated payment method (over term of obligation or on a net present value basis).
- Any other project-related expenses not within any of the above categories.
- Calculation of Total Development Cost (TDC) by component, including total and per unit breakdown (e.g., per square foot clinical, research, office, etc.).
- Sources of debt and equity for total project costs.
- Projected financing sources, including bond-issuing agencies such as HEFA or MIFA, banks, institutional investors, private, corporate or government donors.

APPENDIX 2

TRANSPORTATION ACCESS PLAN - SCOPE

New England Baptist Hospital
Ambulatory Care Building &
Parking Structure

ACCESS PLAN SCOPE

New England Baptist Hospital (NEBH) proposes to construct a 72,000 square foot Ambulatory Care Building and a 435-space parking garage adjacent to its existing hospital complex on Parker Hill.

SCOPE OF WORK

The developer must evaluate the transportation impacts associated with the proposed project. The results of this evaluation will be documented in an Access Plan prepared for submission to the Boston Transportation Department (BTD). The report will include the following.

- A definition of existing traffic, transit, and parking conditions.
- An evaluation of the project's long-term impacts on traffic, transit and pedestrian activities as well as on parking demand.
- An evaluation of the project's short-term traffic impacts related to construction activity.
- Identification of appropriate measures to mitigate project impacts, including long-term project impact monitoring.

In the preparation of the Access Plan, use should be made of all available existing studies and data.

STUDY AREA

The following intersections will be studied:

a. Tremont/Parker St.
b. Huntington/Parker Hill St.
c. South Huntington/Heath St.
d. Parker/Heath St. (Heath Sq.)

DEFINITION OF TASKS

Task 1. Description of Existing Transportation Conditions

The Existing Conditions component will present data on the various transportation systems within the study area, and will provide measures of levels of service, available capacity and other analysis as appropriate to identify any current deficiencies in those systems.

1.1 Traffic. Available traffic volume counts will be supplemented with new counts, as necessary. Based on data gathered from all sources, a preliminary base traffic volume network will be developed to represent existing morning and evening peak hour conditions.

Trip generation characteristics of the existing NEBH will be determined by survey, for use in assessing the overall impact of the Hospital in the current condition, and to provide a basis for assumptions about the trip generation of the proposed project. NEBH trip generation characteristics should be presented in terms of total person trips, disaggregated by employee type and mode of travel.

Trip distribution characteristics of the existing NEBH will likewise be determined by survey. Local distribution is of particular importance, to understand the routes by which NEBH patients and staff access the site. Main and alternative routes to the site from all points of the compass and from all the major arterials (Huntington, Heath, Columbus, Tremont) should be identified. Use of such local streets as Calumet, Sachem, Wensley, Estey, etc. should be examined.

Capacity analysis will be performed to determine level of service at all study area intersections.

1.2 Parking. Existing parking conditions, both on the NEBH campus and in the surrounding neighborhood, will be defined.

The existing parking plan for the NEBH campus will be presented. The inventory of existing on-site parking spaces will include: number of spaces: occupation of spaces by facility, user type (patient, doctor, nurse, staff, etc.), hour of peak occupancy, and turnover rate; rates charged for use; location of any high-occupancy vehicle spaces.

Survey of off-site spaces will be performed to determine availability of parking for NEBH-related users and local residents. Streets regulated by Mission Hill Resident Parking Program will be identified on a map, along with unregulated areas. Incidence of on-street parking by NEBH-related users will be determined, both in unregulated and resident-parking areas.

1.3 Transit. The operating characteristics of the area's private bus carrier services and Massachusetts Bay Transportation Authority (MBTA) services will be documented.

1.4 Pedestrians. Pedestrian conditions on sidewalks and intersections adjacent to the site will be described. Describe major pedestrian corridors to and pathways within the site. Estimate volumes of pedestrians using same. Describe conditions of corridors, including any deficiencies or barriers.

Task 2. Evaluation of Long-Term Transportation Impacts

The traffic impacts of the proposed development will be analyzed in detail. Expected long-term transportation conditions in the study area will be estimated and evaluated. Impacts of traffic generated by the project will be analyzed in detail and presented in comparison with existing conditions and a "No-Build" scenario, which would represent the situation at the horizon year if the project site were to remain in its current use.

2.1 Trip Generation. The proposed use of the new Ambulatory Care Building will be evaluated to determine the project's person-trip generation characteristics, which will be translated into vehicle trips by use of modal split and vehicle occupancy assumptions consistent with those derived from the survey of the existing NEBH campus, or otherwise as approved by the BTD. Trip generation will be presented by trip type (patient, visitor, doctor, nurse, etc.), and by time of day. Daily trips will be presented as well as AM an PM peak hour.

2.2 Trip Distribution. As with trip generation, trip distribution should be performed specifically for the projec site. Estimations should be made of the probable origin of work and non-work trips to the site, on the basis potential employee pool, the service area of the hospital, and the analysis of trip distribution performed for the existing condition. Trip distribution is most appropriately described in terms of corridor of origin, e.g. Northwest, Southeast, etc.

2.3 Conditions to be Analyzed. In addition to existing conditions, the following future conditions will be analyzed at the Study Intersections:

a. No-Build (with only background projects anticipated to be completed included).

b. Full-Build (with the addition of project-related impacts).

The Build scenario must show the AM, PM and weekend peak hour levels of service at the Study Intersections under each of the roadway alternatives examined.

2.4 Background Development Projects. Any previously approved building construction projects to be included in the No-Build evaluation will be reviewed with Boston Redevelopment Authority and BTD staff prior to the analysis.

2.5 Evaluation of Transportation Impacts. New trips expected to be attracted to the proposed development will be added to demands carried by the existing roadway system plus new trips from background projects. Morning, evening and weekend peak hour and daily increases will be developed and analyzed for all travel modes.

2.5.1 Traffic Impacts. Volume-to-capacity ratio (v/c), available reserve capacity (ARC), level of service (LOS) and delay calculations at, and queue lengths between, the study intersections.

2.5.2 Site Circulation. A detailed site plan will be provided, showing proposed location of all vehicular and pedestrian access, drop-off or valet service locations, taxi waiting areas, delivery points, and internal pedestrian circulation.

2.5.3 Transit. The usage of public transportation will be described, and the impact of the project on transit services.

2.5.4 Pedestrian Impacts. Pedestrian volumes generated by the project will be presented. Future pedestrian volumes will be projected. Indicate impact of new pedestrian trips on pedestrian levels of service and amenities.

Pedestrian paths and corridors across and through the project site will be identified on a site plan.

2.5.5 Trucks and Service Vehicles. Truck and service vehicle traffic to the site will estimated. Access and egress for emergency vehicles will also be evaluated.

2.6 Parking Impacts. Demand for parking generated by the proposed project will be calculated. New parking proposed will be allocated to various users. Parking operations will be described in detail.

2.6.1 Parking demand generated by project by use, both long-term and short-term. On the basis of the trip generation projected in section 2.1 above, and using appropriate turnover rates, estimate project-generated parking demand in horizon year. Indicate user type (employee, visitor, retail patron, patient, etc.).

2.6.2 Displacement of existing on-site spaces will be noted, and replacement of same within new facility. Conversely, degree to which proposed on-site facilities will replace existing spaces/demand at other locations will be identified.

2.6.3 Proposed management plan for parking facilities. Method of directing patrons to parking, parking pricing, and valet operations will be detailed.

2.6.4 A plan will be provided of all parking facilities, including layout, access, and size of space

3. Evaluation of Short-Term Impacts (Construction Period)

The transportation assessment will evaluate the impacts of the project during the construction period, including: mode of arrival for construction workers; parking provisions for construction workers and construction materials deliveries; frequency, times and routes of truck movements and construction materials deliveries; temporary storage of construction equipment and materials; the need for full or partial street closures or street occupancy during construction will be defined.

4. Development of Mitigation Measures

Programs or strategies to reduce the transportation impacts will be developed and may include the following:

- o Measures to minimize vehicle-trip generation.
- o Roadway/traffic operation improvements.
- o Transit improvements.
- o Parking management improvements.
- o Pedestrian improvements.
- o Long-term project impact monitoring.

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EXHIBIT 2

New England Baptist Hospital
Proposed Ambulatory Care Building and Parking Structure
Preliminary DPIR Schedule

1. **General Information/Project Description**

   - Receive information needed from Team - February 10
   - First draft for Team review - February 15

2. **Transportation Component**

   - Complete traffic counts - February 18
   - Complete employee survey - February 23
   - Collect all data for existing and new trips to the project - March 1
   - Complete level of service calculations - March 7
   - First draft ready for Team review - March 14

3. **Wind**

   - Collect information on building elevations and roof plan for project - February 10
   - First draft ready for Team review - February 28

4. **Air Quality**

   - Identify sensitive receptors - February 17
   - Collect information on garage exhaust - February 22
   - Obtain traffic data for study - March 1
   - Complete protocol to DEP/BRA - March 3
   - First draft ready for Team review - March 14

5. **Solid and Hazardous Waste**

   - Collect waste information from hospital - February 17
   - First draft ready for Team review - February 24

6. **Noise**

   - Collect all necessary data for analysis - February 24
   - First draft ready for Team review - March 8

7. **Geotechnical (from Geotechnical Consultant)**

- First draft ready for Team review - February 22
- Draft to HMM for incorporation into DPIR - March 4

8. **Construction**

- Collect data on staging, access routes, construction equipment - February 16
- First draft ready for Team review - March 4

9. **Urban Design Component (from WRA)**

- First draft from WRA for Team review - February 21
- Draft to HMM for incorporation into the DPIR - March 8
- Graphics to HMM - March 8

10. **Historic Resources Component**

- First draft ready for Team review - February 17

11. **Infrastructure Systems Component**

- Collect all data on infrastructure - February 24
- First draft ready for Team review - March 4

12. **Other**

- Draft of Management and Maintenance Plan - March 4
- Conservation Restriction under Open Space issues (NEBH/GPH)

Major Milestones

Complete Review Draft to Team - March 15
Submission of Final DPIR Review Draft to BRA and Team - March 25
Submission of DPIR - April 8

APPENDIX 3

SUBMISSION REQUIREMENTS FOR DESIGN DEVELOPMENT AND CONTRACT DOCUMENTS SUBMISSIONS

PHASE II SUBMISSION: DESIGN DEVELOPMENT

1. Revised written description of project.

2. Revised site sections.

3. Revised site plan showing:

   a. Relationship of the proposed building and open space and existing adjacent buildings, open spaces, streets, and buildings and open spaces across streets.

   b. Proposed site improvements and amenities including paving, landscaping, lighting and street furniture.

   c. Building and site dimensions, including setbacks and other dimensions subject to zoning requirements.

   d. Any site improvements or areas proposed to be developed by some other party (including identification of responsible party).

   e. Proposed site grading, including typical existing and proposed grades at parcel lines.

4. Dimensioned drawings at an appropriate scale (e.g., 1"=8') developed from approved schematic design drawings which reflect the impact of proposed structural and mechanical systems on the appearance of exterior facades, interior public spaces, and roofscape including:

   a. Building plans

   b. Preliminary structural drawings

   c. Preliminary mechanical drawings

   d. Sections

   e. Elevations showing the project in the context of the surrounding area as required by the Authority to illustrate relationships of character, scale and materials.

5. Large-scale (e.g., 3/4"=1'-10") typical exterior wall sections, elevations and details sufficient to describe specific architectural components and methods of their assembly.

6. Outline specifications of all materials for site improvements, exterior facades, roofscape, and interior public spaces.

7. Eye-level perspective drawings showing the project in the context of the surrounding area.

8. Samples of all proposed exterior materials.

9. Complete photo documentation (35 mm color slides) of above components including major changes from initial submission to project approval.

PHASE III SUBMISSION: CONTRACT DOCUMENTS

1. Final written description of project.

2. A site plan showing all site development and landscape details for lighting, paving, planting, street furniture, utilities, grading, drainage, access, service, and parking.

3. Complete architectural and engineering drawings and specifications.

4. Full-size assemblies (at the project site) of exterior materials and details of construction.

5. Eye-level perspective drawings or presentation model that accurately represents the project, and a rendered site plan showing all adjacent existing and proposed structures, streets and site improvements.

6. Site and building plan at 1"-100' for Authority's use in updating its 1"=100" photogrammetric map sheets.

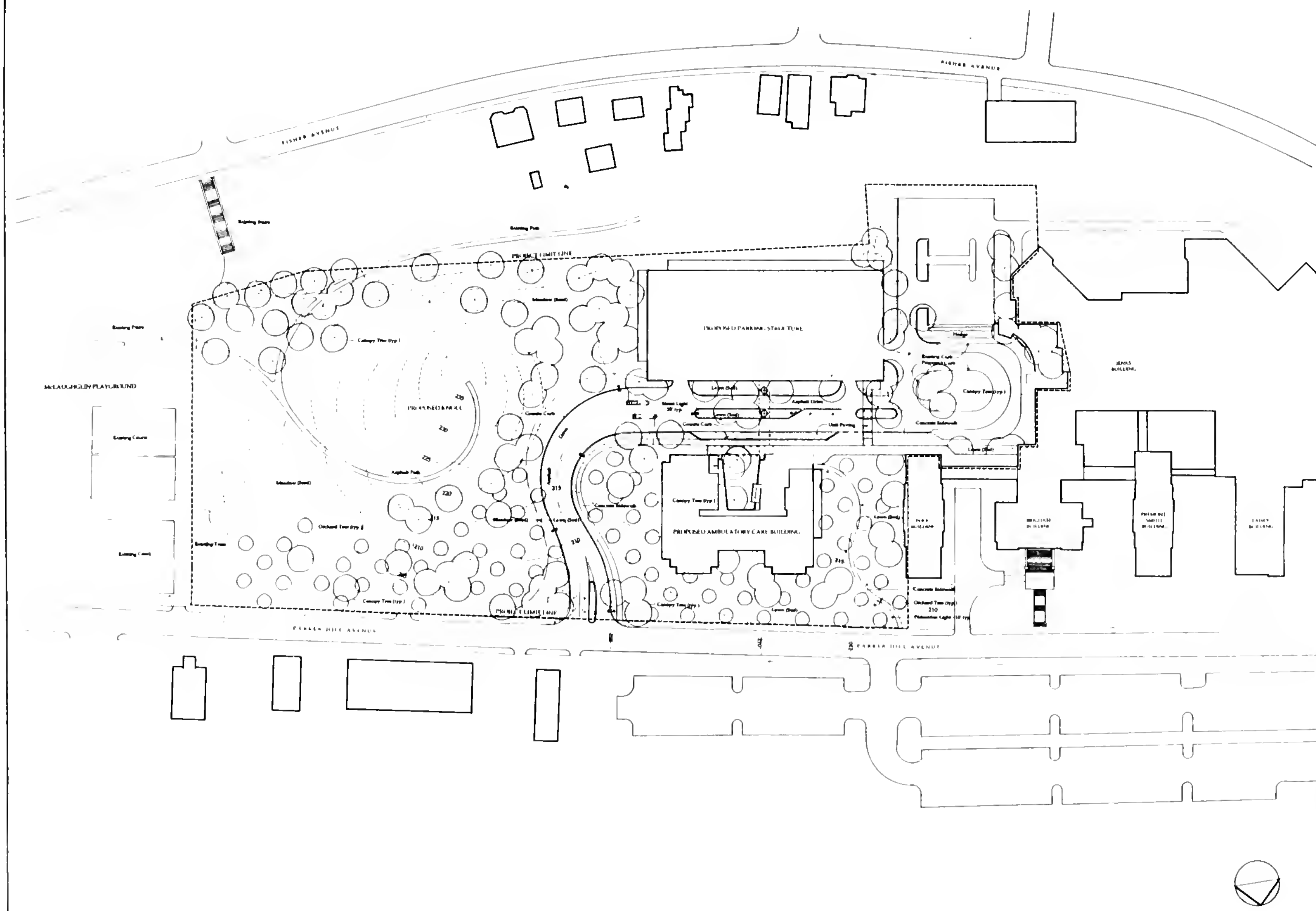
PHASE IV SUBMISSION: CONSTRUCTION INSPECTION

1. All contract addenda, proposed change orders, and other modifications and revisions of approved contract documents which affect site improvements, exterior facades, roofscape, and interior public spaces shall be submitted to the Authority prior to taking effect.

2. Shop drawings of architectural components which differ from or were not fully described in contract documents.

APPENDIX B

Schematic Design Submission



PROGRESS PRINT

New England Baptist Hospital

AMBULATORY CARE BUILDING AND PARKING STRUCTURE

Owner
NEW ENGLAND BAPTIST HOSPITAL
125 Parker Hill Avenue
Boston MA 02120

Architect
WILLIAM RAWN ASSOCIATES, Architects Inc.
101 Tremont Street
Boston MA 02108

Landscape Architect
CHILD ASSOCIATES
240 Newbury Street
Boston MA 02116

Structural Engineer
LEMESSURIER ASSOCIATES
1033 Massachusetts Avenue
Cambridge MA 02138

Mechanical Engineer
[illegible]
42 Temple Place
Boston MA 02111

Electrical Engineer
[illegible]

Civil Engineer
[illegible]

Geotechnical Engineer
HALEY & ALDRICH
[illegible]
Cambridge MA

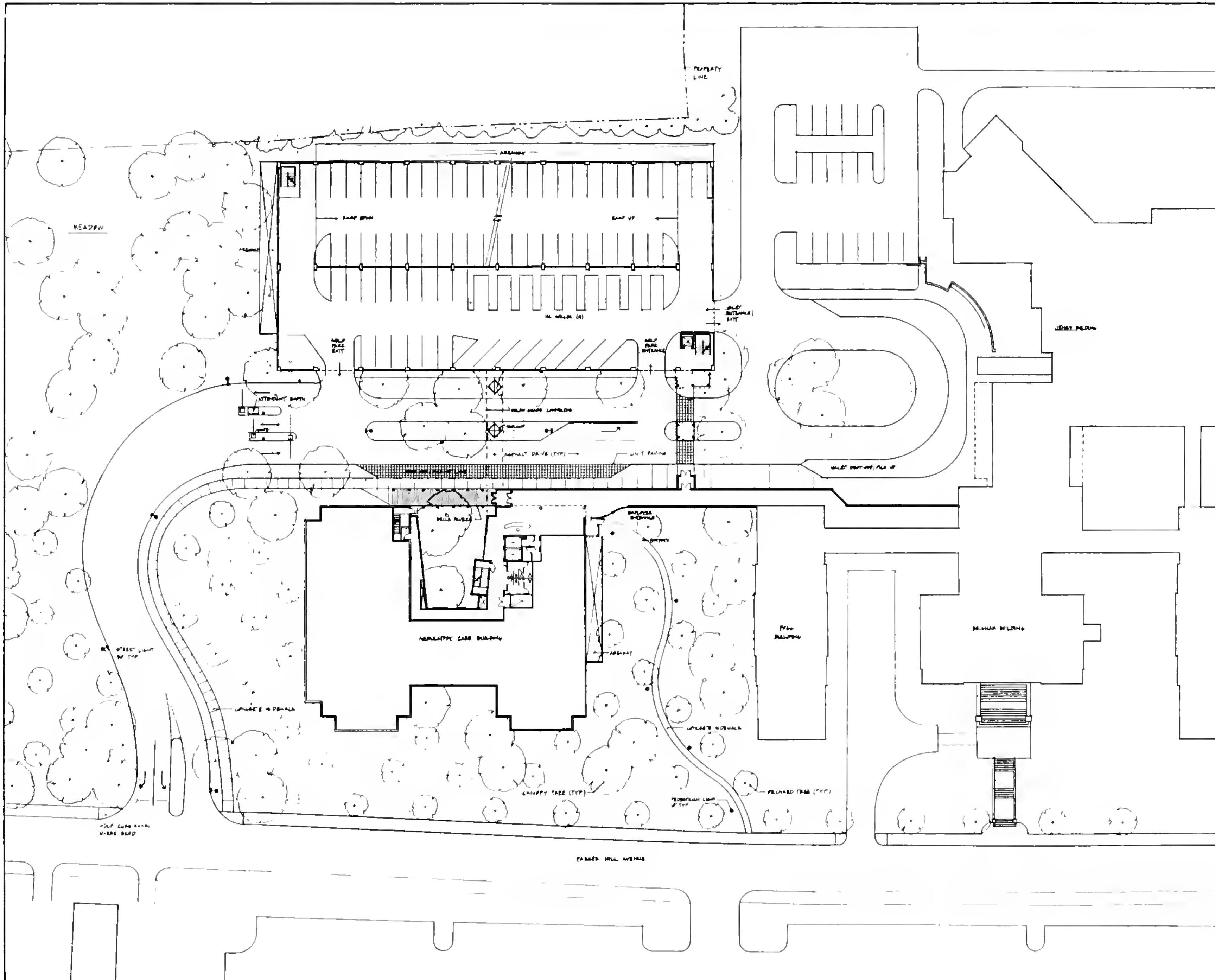
Parking Consultant
CARL WALKER ENGINEERS
[illegible]
Kalamazoo MI

02/18/94	Schematic Design
DATE	DESCRIPTION

SITE PLAN

SCALE 1"=40'

L-1



New England Baptist Hospital

AMBULATORY CARE BUILDING AND PARKING STRUCTURE

Owner
NEW ENGLAND BAPTIST HOSPITAL
125 Parker Hill Avenue
Boston, MA 02120

Architect
WILLIAM RAWN ASSOCIATES, Architects, Inc.
103 Tremont Street
Boston, MA 02108

Landscape Architect
CHILD ASSOCIATES
240 Newbury Street
Boston, MA 02116

Structural Engineer
LEMESSURIER ASSOCIATES
1033 Massachusetts Avenue
Cambridge, MA 02138

Mechanical Engineer
TMP CONSULTING ENGINEERS, INC
53 Temple Place
Boston, MA 02111

Electrical Engineer
LOTTERO + MASON ASSOCIATES, INC
133 Lincoln Street
Boston, MA 02111

Civil Engineer
H.W. MOORE ASSOCIATES, INC
112 Shawmut Avenue
Boston, MA 02118

Geotechnical Engineer
HALEY & ALDRICH INC
58 Charles Street
Cambridge, MA 02141

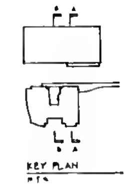
Parking Consultant
CARL WALKER ENGINEERS
445 W. Michigan Avenue
Kalamazoo, MI 49007

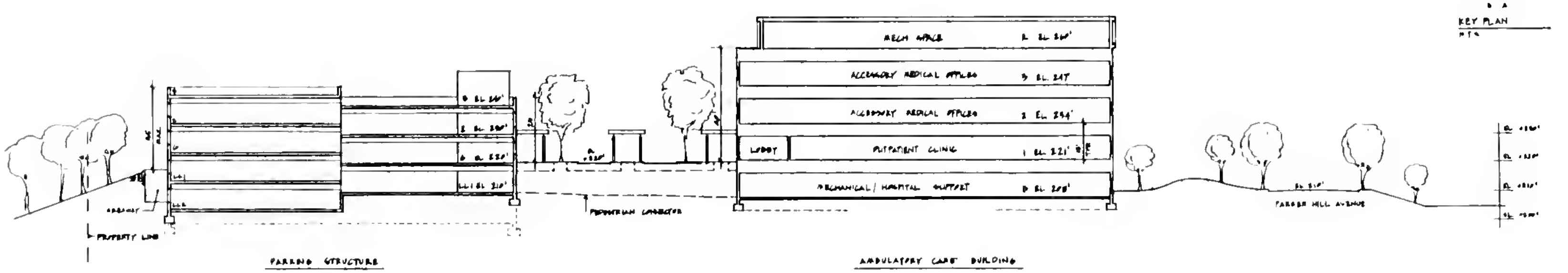
DATE	DESCRIPTION

SITE PLAN

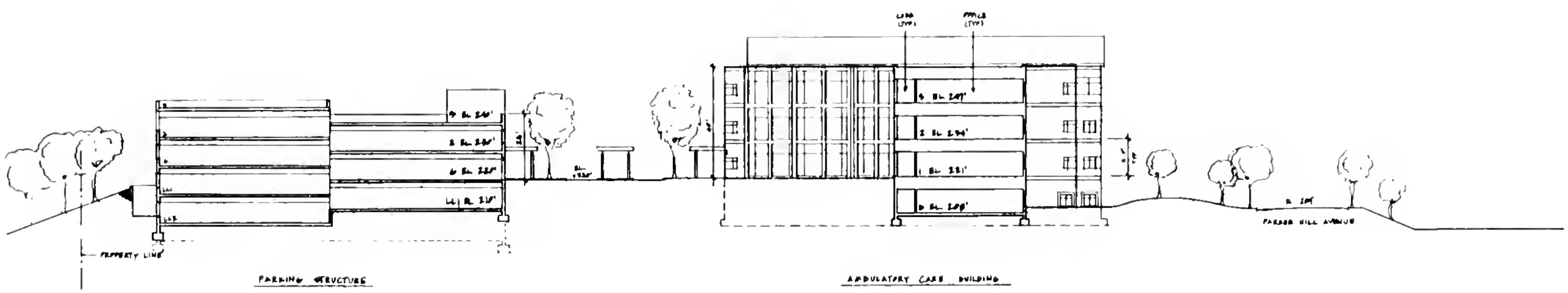
SCALE	DRAWN	CHECKED

A1





1 SECTION A-A



2 SECTION B-B

New England Baptist Hospital

AMBULATORY CARE BUILDING AND PARKING STRUCTURE

Owner
NEW ENGLAND BAPTIST HOSPITAL
125 Parker Hill Avenue
Boston, MA 02120

Architect
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HALEY & ALDRICH INC
58 Charles Street
Cambridge MA 02141

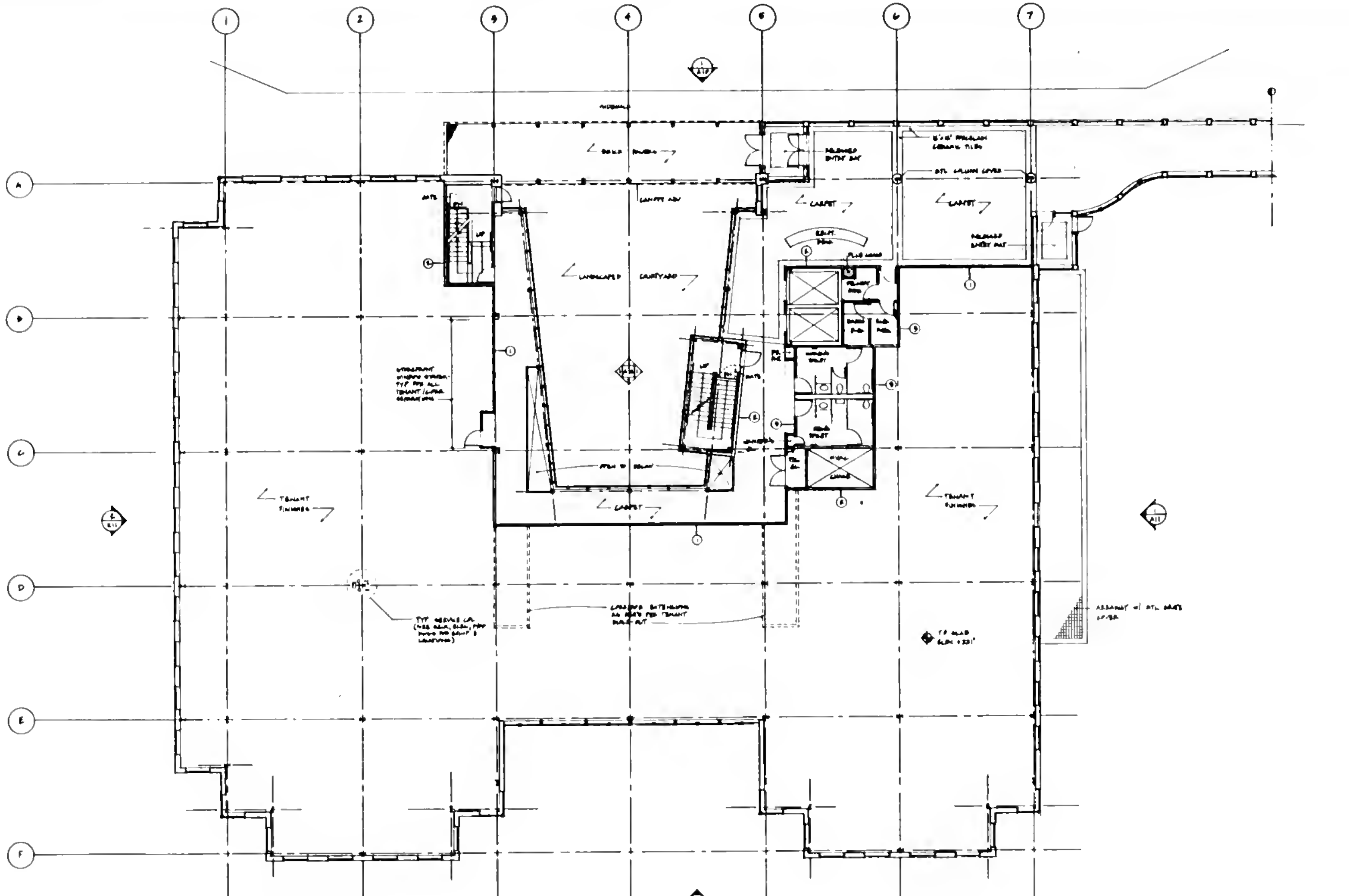
Parking Consultant
CARL WALKER ENGINEERS
445 W. Michigan Avenue
Kalamazoo MI 49007

DATE	DESCRIPTION
6 9 94	
2 18 94	

SITE SECTIONS

SCALE	DRAWN	CHECKED
1/16" = 1'0"	DY	

A2



1 GROUND FLOOR PLAN

NOTE WALL TYPES

New England Baptist Hospital

AMBULATORY CARE BUILDING AND PARKING STRUCTURE

Owner
NEW ENGLAND BAPTIST HOSPITAL
125 Parker Hill Avenue
Boston, MA 02120

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Cambridge, MA 02141

Parking Consultant
CARL WALKER ENGINEERS
445 W. Michigan Avenue
Kalamazoo, MI 49007

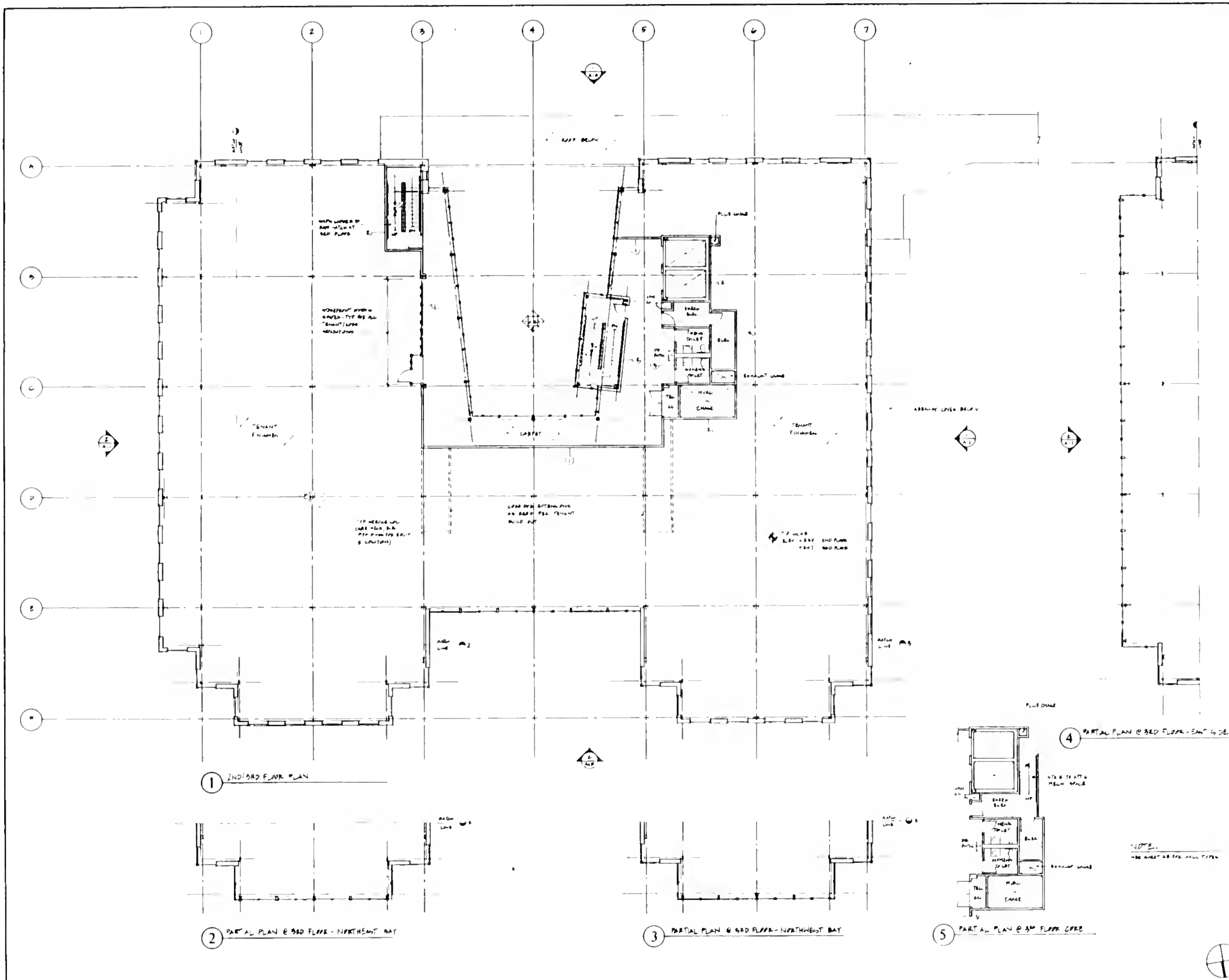
DATE	DESCRIPTION

AMBULATORY CARE BUILDING

GROUND FLOOR PLAN

SCALE | DRAWN BY | CHECKED

A3



New England Baptist Hospital

AMBULATORY CARE BUILDING AND PARKING STRUCTURE

Owner
NEW ENGLAND BAPTIST HOSPITAL
125 Parker Hill Avenue
Boston MA 02120

Architects
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CARL WALKER ENGINEERS
445 W. Michigan Avenue
Kalamazoo MI 49007

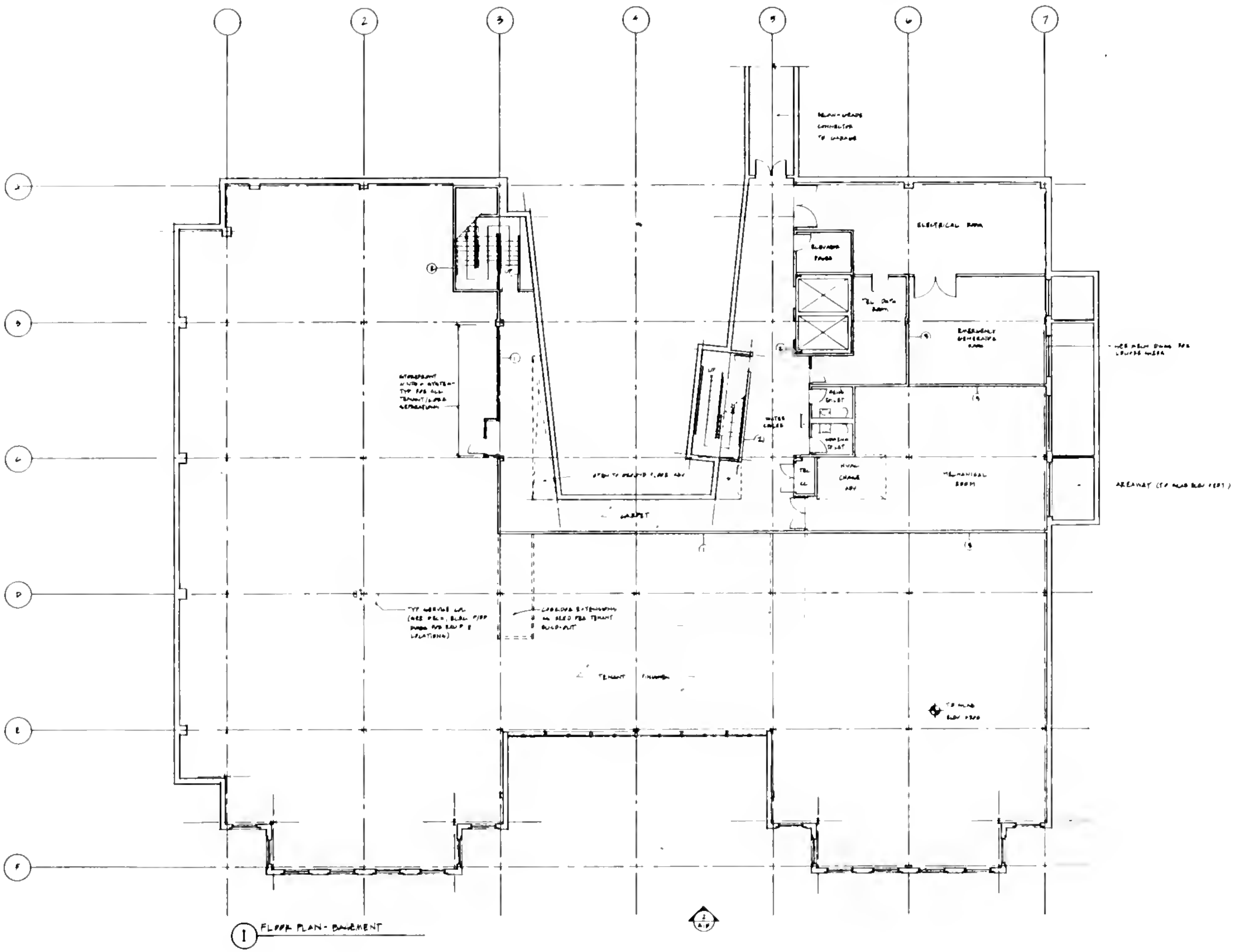
DATE	DESCRIPTION

AMBULATORY CARE BUILDING

2nd & 3rd FLOOR PLAN

SCALE	DRAWN	CHECKED

A4



1 FLOOR PLAN - BASEMENT

NOTE

New England Baptist Hospital

AMBULATORY CARE BUILDING AND PARKING STRUCTURE

Owner
NEW ENGLAND BAPTIST HOSPITAL
125 Parker Hill Avenue
Boston MA 02120

Architect
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Geotechnical Engineer
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Cambridge MA 02141

Parking Consultant
CARL WALKER ENGINEERS
445 W. Michigan Avenue
Kalamazoo MI 49007

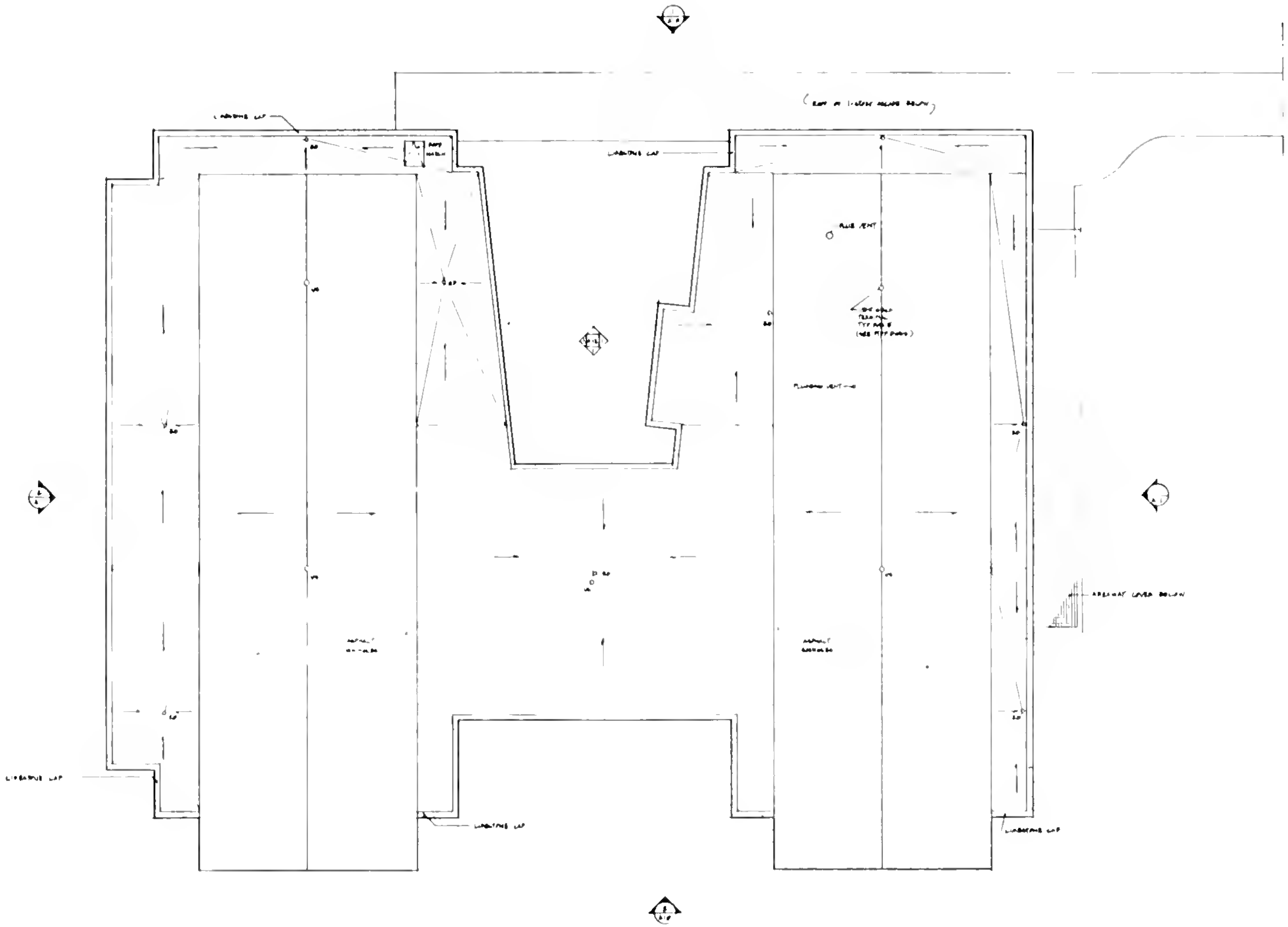
DATE	DESCRIPTION
9.10.94	
8.8.94	SCHEMATIC DESIGN

AMBULATORY CARE BUILDING

BASEMENT PLAN

SCALE	DRAWN BY	CHECKED
1/16" = 1'-0"		

A5



1 ROOF PLAN

PROGRESS PRINT

New England Baptist Hospital

AMBULATORY CARE BUILDING AND PARKING STRUCTURE

Owner
NEW ENGLAND BAPTIST HOSPITAL
125 Parker Hill Avenue
Boston, MA 02120

Architects
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Cambridge, MA 02141

Parking Consultant
CARL WALKER ENGINEERS
445 W. Michigan Avenue
Kalamazoo, MI 49007

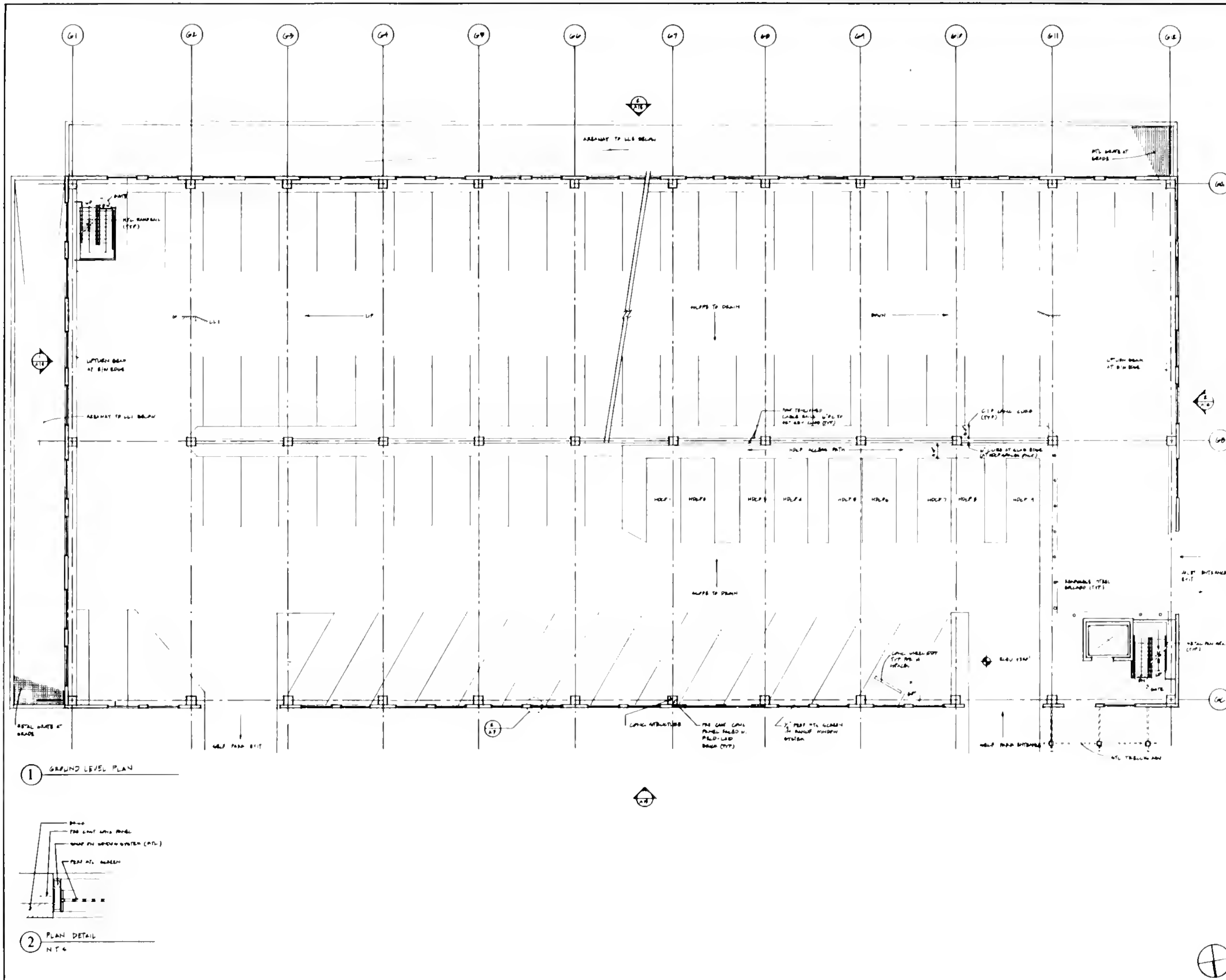
DATE	DESCRIPTION

AMBULATORY CARE BUILDING

ROOF PLAN

SCALE	DRAWN BY	CHECKED

A6



New England Baptist Hospital

AMBULATORY CARE BUILDING AND PARKING STRUCTURE

Owner
NEW ENGLAND BAPTIST HOSPITAL
125 Parker Hill Avenue
Boston, MA 02120

Architect
WILLIAM RAWN ASSOCIATES, Architects, Inc.
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Boston, MA 02108

Landscape Architect
CHILD ASSOCIATES
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Structural Engineer
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Cambridge, MA 02138

Mechanical Engineer
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Boston, MA 02111

Electrical Engineer
LOTTERO + MASON ASSOCIATES, INC.
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Boston, MA 02111

Civil Engineer
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112 Shawmut Avenue
Boston, MA 02118

Geotechnical Engineer
HALEY & ALDRICH, INC.
58 Charles Street
Cambridge, MA 02141

Parking Consultant
CARL WALKER ENGINEERS
445 W. Michigan Avenue
Kalamazoo, MI 49007

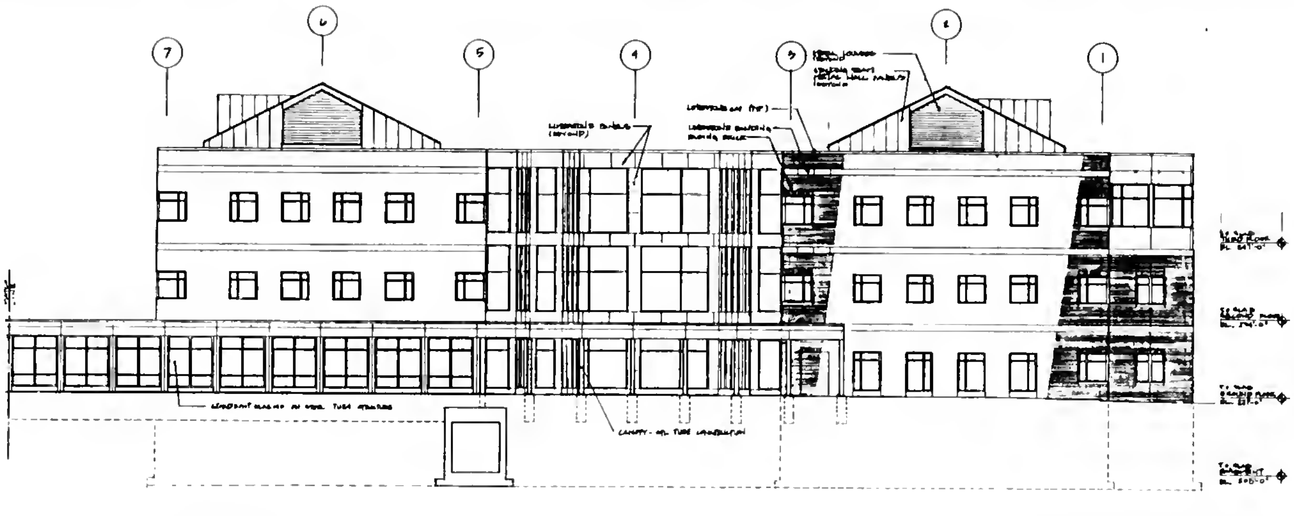
DATE	DESCRIPTION

PARKING STRUCTURE

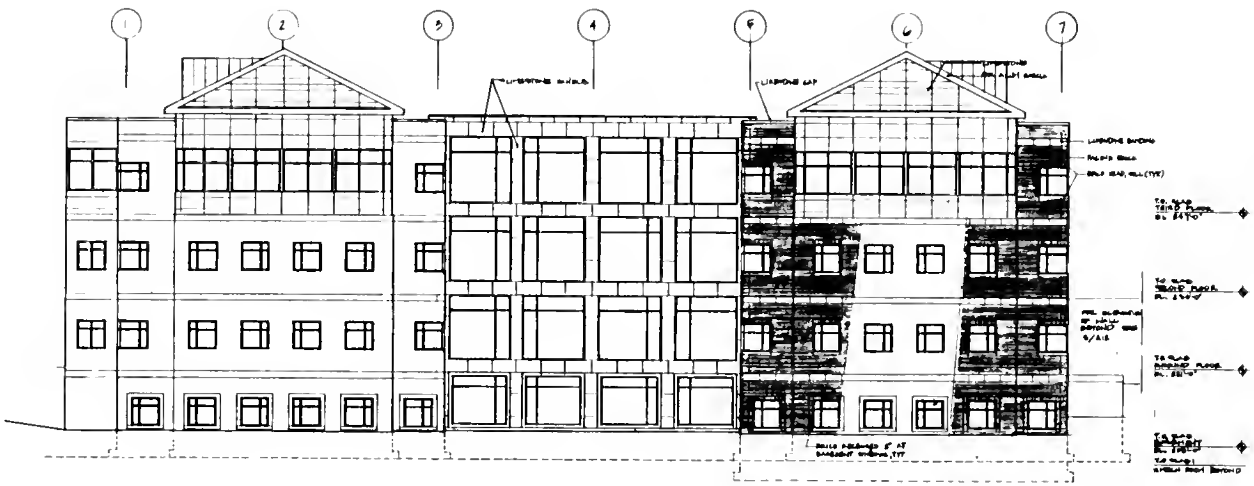
GROUND LEVEL PLAN

SCALE	DRAWN	CHECKED
1/16" = 1'		

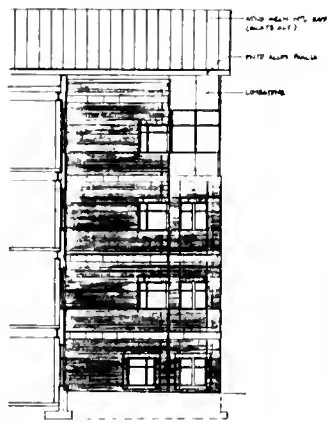
A7



1 SOUTH ELEVATION



2 NORTH ELEVATION



3 PARTIAL EAST ELEVATION @ NORTH LIGHT COURT (WEST ELEVATION - SIM. OPP. HAND)

New England Baptist Hospital

AMBULATORY CARE BUILDING AND PARKING STRUCTURE

Owner
NEW ENGLAND BAPTIST HOSPITAL
125 Parker Hill Avenue
Boston, MA 02120

Architect
WILLIAM RAWN ASSOCIATES Architects, Inc
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Landscape Architect
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Parking Consultant
CARL WALKER ENGINEERS
445 W. Michigan Avenue
Kalamazoo, MI 49007

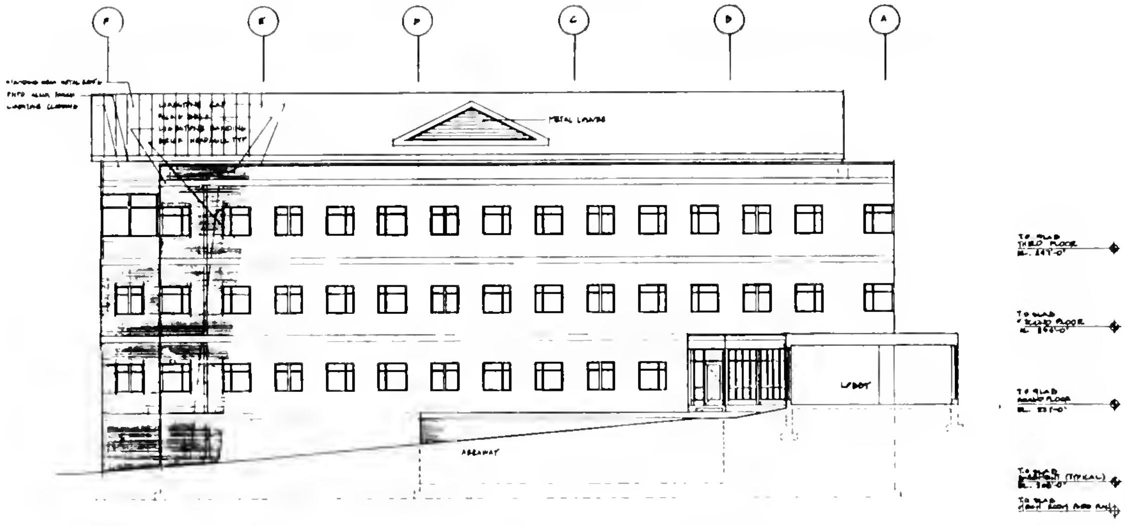
DATE	DESCRIPTION
5.10.94	SCHEMATIC DESIGN
9.10.94	

AMBULATORY CARE BUILDING

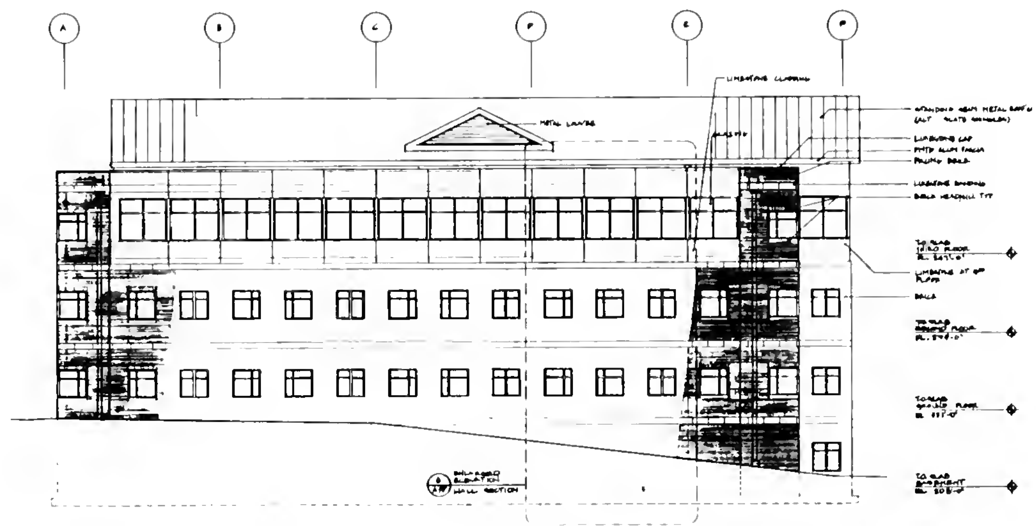
BUILDING ELEVATIONS

SCALE	DRAWN	CHECKED
1/16" = 1'-0"	WVW	

A10



1 WEST ELEVATION



2 EAST ELEVATION

New England Baptist Hospital

AMBULATORY CARE BUILDING AND PARKING STRUCTURE

Owner
NEW ENGLAND BAPTIST HOSPITAL
125 Parker Hill Avenue
Boston, MA 02120

Architect
WILLIAM RAWN ASSOCIATES, Architects Inc.
101 Tremont Street
Boston, MA 02108

Landscape Architect
CHILD ASSOCIATES
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Boston, MA 02116

Structural Engineer
LEMESSURIER ASSOCIATES
1033 Massachusetts Avenue
Cambridge, MA 02138

Mechanical Engineer
TMP CONSULTING ENGINEERS, INC.
93 Temple Place
Boston, MA 02111

Electrical Engineer
LOTTERO + MASON ASSOCIATES, INC.
112 Lincoln Street
Boston, MA 02111

Civil Engineer
H.W. MOORE ASSOCIATES, INC.
112 Shawmut Avenue
Boston, MA 02118

Geotechnical Engineer
HALEY & ALDRICH, INC.
58 Charles Street
Cambridge, MA 02141

Parking Consultant
CARL WALKER ENGINEERS
445 W. Michigan Avenue
Kalamazoo, MI 49007

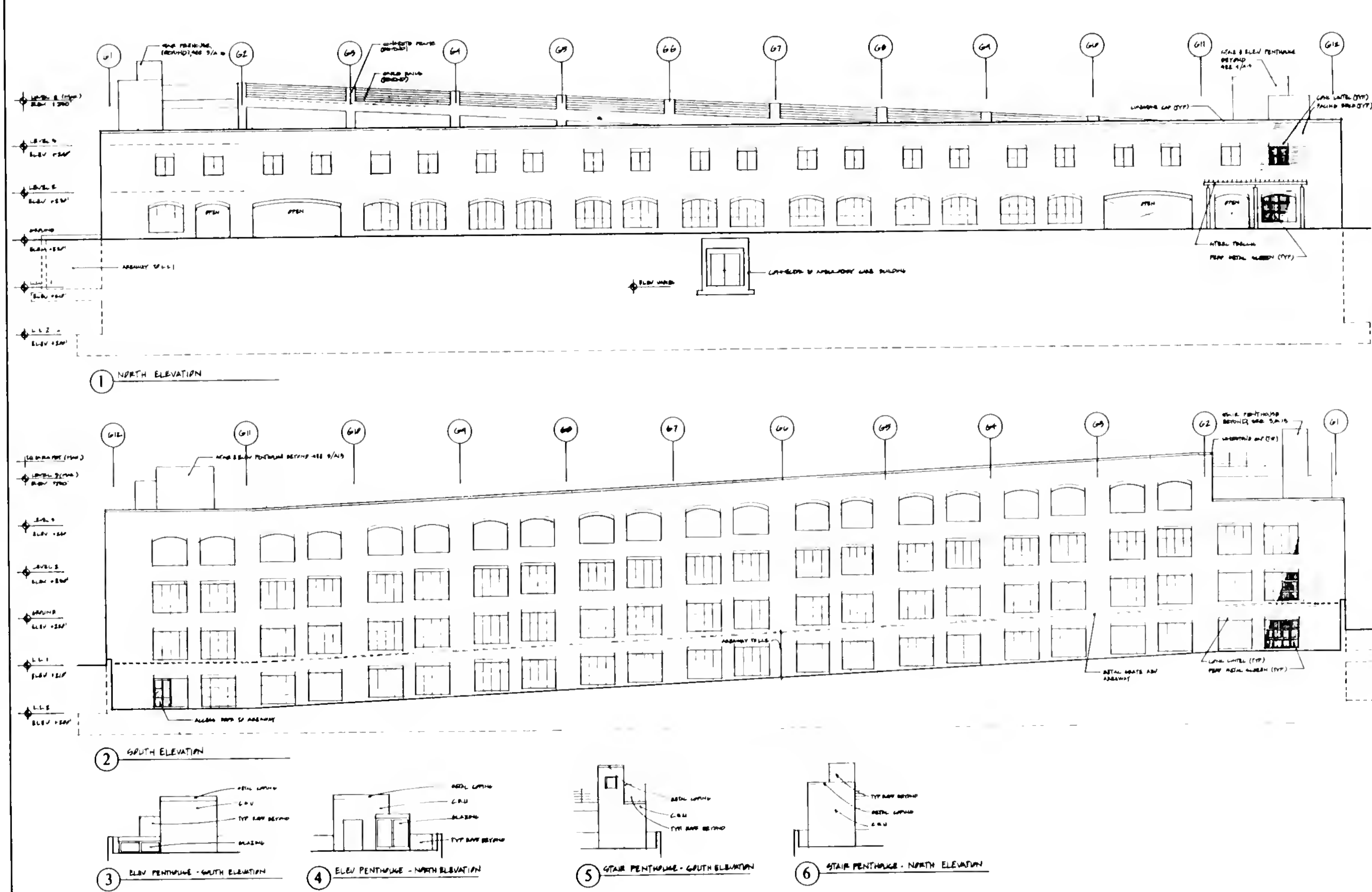
9.18.96	
3.8.96	SCHEMATIC DESIGN
DATE	DESCRIPTION

AMBULATORY CARE BUILDING

BUILDING ELEVATIONS

SCALE	DRAWN	CHECKED
1/8" = 1'-0"	NVH	

A11



New England Baptist Hospital

AMBULATORY CARE BUILDING AND PARKING STRUCTURE

Owner
NEW ENGLAND BAPTIST HOSPITAL
125 Parker Hill Avenue
Boston, MA 02120

Architect
WILLIAM RAWN ASSOCIATES Architects Inc
101 Tremont Street
Boston MA 02108

Landscape Architect
CHILD ASSOCIATES
240 Newbury Street
Boston MA 02116

Structural Engineer
LEMESSURIER ASSOCIATES
1033 Massachusetts Avenue
Cambridge MA 02138

Mechanical Engineer
TMP CONSULTING ENGINEERS INC
12 Temple Place
Boston MA 02111

Electrical Engineer
LOTTERO + MASON ASSOCIATES INC
132 Lincoln Street
Boston MA 02111

Civil Engineer
H.W. MOORE ASSOCIATES INC
112 Shawmut Avenue
Boston MA 02118

Geotechnical Engineer
HALEY & ALDRICH INC
58 Charles Street
Cambridge MA 02141

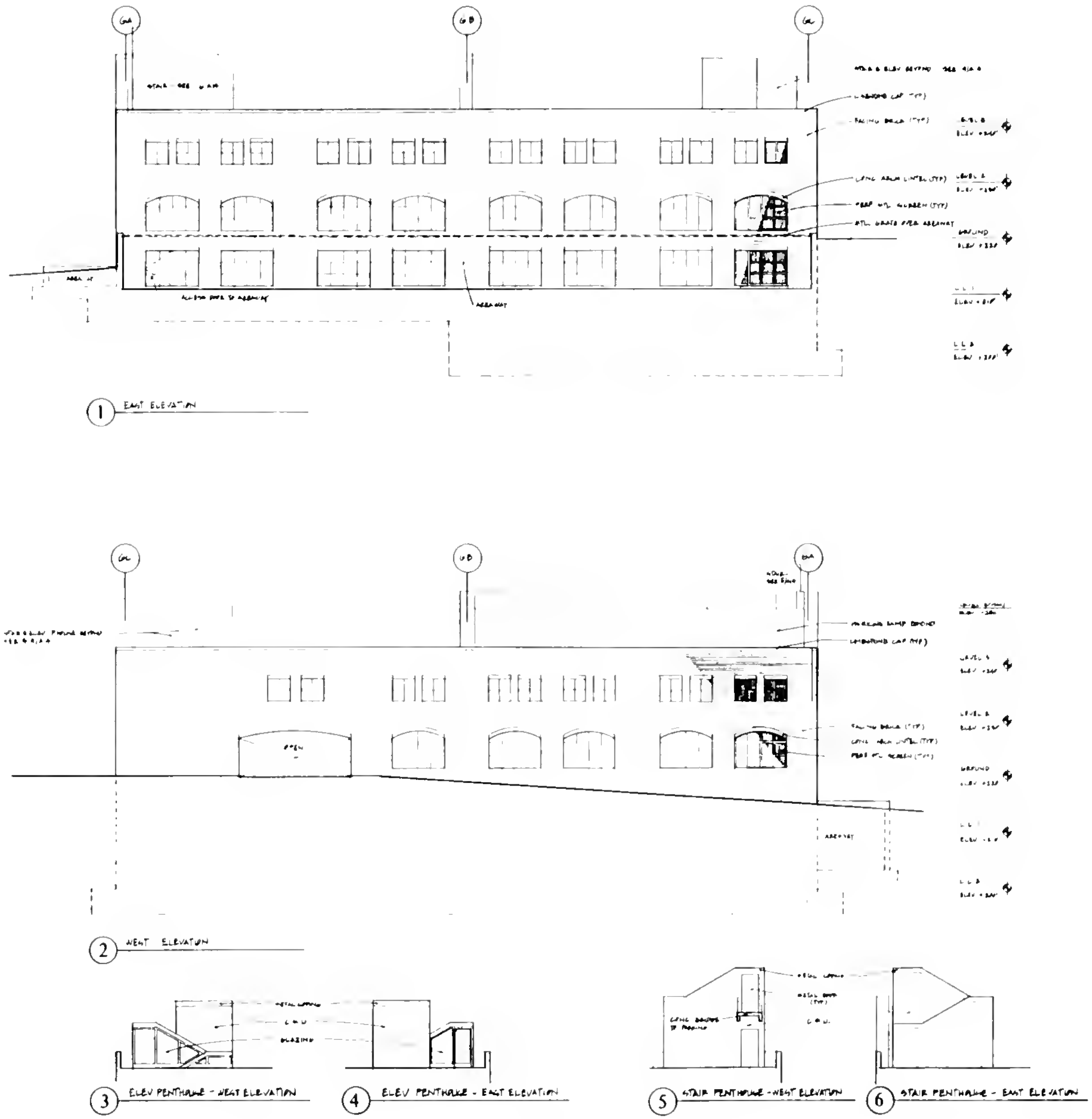
Parking Consultant
CARL WALKER ENGINEERS
441 W. Michigan Avenue
Kalamazoo MI 49007

DATE	DESCRIPTION
2-8-96	SCHEMATIC DESIGN

PARKING STRUCTURE
BUILDING ELEVATIONS

SCALE	DRAWN	CHECKED
1/8" = 1'-0"	PT	

A13



New England
Baptist Hospital

AMBULATORY
CARE BUILDING
AND PARKING
STRUCTURE

Owner
NEW ENGLAND BAPTIST HOSPITAL
125 Parker Hill Avenue
Boston, MA 02120

Developer
MORTON AND
Commercial Development Division
2110 Washington Street
Newton, MA 02162

Architect
WILLIAM RAWN ASSOCIATES, Architects Inc
101 Tremont Street
Boston, MA 02108

Landscape Architect
CHILD ASSOCIATES
240 Newbury Street
Boston, MA 02116

Structural Engineer
LEMESSURIER ASSOCIATES
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Cambridge, MA 02138

Mechanical Engineer
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112 Shawmut Avenue
Boston, MA 02118

Parking Engineer
CARL WALKER ENGINEERS
445 W. Michigan Avenue
Kalamazoo, MI 49007

[illegible]	[illegible]
[illegible]	[illegible]
DATE	DESCRIPTION

PARKING STRUCTURE

BUILDING ELEVATIONS

SCALE	DRAWN	CHECKED
[illegible]	[illegible]	

A14

APPENDIX C

Traffic Data

New England Baptist Hospital

Historical and Projected Inpatient and Outpatient Activity

Service/Department	1992		1993		1994 *		1995 **		1998	
					Year					
Inpatient/Related Services	Admits	Days	Admits	Days	Admits	Days	Admits	Days	Admits	Days
Orthopedic Surgery	3,261	19,605	2,733	16,198	2,932	17,299	2,975	17,699	3,020	17,964
Surgery	1,466	7,840	1,237	7,742	1,340	8,174	1,221	8,253	1,033	8,754
Medicine	3,014	22,810	2,682	21,003	2,596	18,172	2,346	16,024	1,719	9,067
Jordan Rehab Unit	0	0	461	5,763	560	6,048	710	7,455	788	7,880
Sub-Total Inpatient Services	**7,741**	**50,255**	**7,113**	**50,706**	**7,428**	**49,693**	**7,252**	**49,431**	**6,560**	**43,665**
Outpatient Department Services		Visits		Visits		Visits		Visits		Visits
Immediate Care		3,158		2,172		2,322		2,440		2,822
OPD Clinics (incl'g POPs)		2,890		3,226		3,813		4,233		5,617
Arthritis Service		0		56		219		311		640
"Seed" Clinics		0		0		250		500		1,250
Bronchoscopy		79		160		160		160		160
Cast Room		929		958		1,000		1,000		1,500
Employee/Student Health		4,261		1,761		2,000		2,500		4,000
Nutrition Clinic		223		221		272		288		360
Other Outpatient Clinics		0		0		100		200		500
Sub-Total OPD Services		**11,540**		**8,554**		**10,136**		**11,632**		**16,849**
Other Outpatient Services										
Back Center		1,883		2,861		3,000		3,500		5,000
Observation Unit		3,220		3,346		3,432		3,545		4,000
Pre-Admission Screening Unit		4,406		4,219		4,158		4,000		4,000
Physical/Occupational Therapy		6,893		9,664		13,984		17,271		27,900
Foot and Ankle Center		2,803		4,316		4,593		5,850		9,600
Outpatient Surgery		4,524		4,418		4,888		4,681		5,000
Radiation Oncology		0		187		255		402		785
Breast Center		0		0		600		1,200		3,000
Cardiac Diagnostic Testing		1,076		852		996		1,000		1,200
Chemotherapy		444		339		450		417		426
EKG		6,008		5,119		5,235		5,601		6,000
Endoscopy		1,200		1,063		1,169		1,286		1,400
Hemodialysis		378		1,200		1,200		1,200		1,200
Myelography										
Neurophysiology		939		723		639		520		
Respiratory Therapy		2,371		2,136		2,563		2,549		2,837
Sub-Total Other Outpatient		**36,145**		**40,443**		**47,163**		**53,023**		**72,348**
Sub-Total All Outpatient Services		**47,685**		**48,997**		**57,299**		**64,655**		**89,197**
Other Programs/Services										
Guest Program										
Visitors										
Sub-Total Other Programs		**1,600**		**1,719**		**1,800**		**1,836**		**1,948**
Physician Office Practices										
Patient Office Visits		48,000		50,400		52,800		57,600		62,400
Visitors		24,000		25,200		26,400		28,800		31,200
Sub-Total Physician Practices		**72,000**		**75,600**		**79,200**		**86,400**		**93,600**
Total All Stats		**129,026**		**133,429**		**145,727**		**160,143**		**191,305**

* Data annualized from four-month Y-T-D totals

** Based on trend line analysis of historical data, modified for expected changes in patient volume

CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 10: UNSIGNALIZED - 4 APPROACHES (PAGE 1 OF 2)
DATE:03-22-1994 TIME:09:34:57
AM HEATH/PARKER EX

LAST DATASETS LOADED OR SAVED
VOLUME=1AM1EX GEOMETRICS=1AM1EX

```
KEY:    D
        |
     A- -B
        |
        C
```

GENERAL CHARACTERISTICS
POPULATION GREATER THAN 250,000: NO
CONTROLS: FROM C: YIELD
FROM D: YIELD
PREVAILING SPEED: 30 MPH
MAIN STREET # OF LANES: 2 LANES
MAIN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: NO
MAIN STREET APPROACH B - EXCLUSIVE RIGHT TURN LANE: NO

MINOR STREET LANES

APPROACH: C: PARKER NB
EXCLUSIVE LEFT TURN LANES: NO
EXCLUSIVE RIGHT TURN LANES: NO
LARGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
RIGHT TURN ACCELERATION LANE ON MAJOR: NO

APPROACH: D: PARKER SB
EXCLUSIVE LEFT TURN LANES: NO
EXCLUSIVE RIGHT TURN LANES: NO
LARGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
RIGHT TURN ACCELERATION LANE ON MAJOR: NO

SIGHT DISTANCE RESTRICTIONS (in seconds)

APPROACH	A: HEATH EB	B: HEATH WB	C: PARKER NB	D: PARKER SB
LEFTS	0.00	0.00	0.00	0.00
THRUS	0.00	0.00	0.00	0.00
RIGHTS	0.00	0.00	0.00	0.00

APPROACH	A: HEATH EB			B: HEATH WB			C: PARKER NB			D: PARKER SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
VOLUME	129	345	4	5	0	373	0	7	2	0	0	0
PHF	0.92			0.83			0.84			0.90		
ADJ VOLUME	140	375	4	6	0	449	0	8	2	0	0	0
PERCENT GRADE	0.00			0.00			0.00					
PASS CAR/HR	154			7			0	9	3	0	0	0

STEP 1 RIGHT TURNS FROM	C:PARKER NB	D:PARKER SB
CONFLICTING FLOWS	377	225
CRITICAL GAPS	5.0	5.0
CAPACITY	816	958
CAPACITY USED	0%	0%
IMPEDANCE FACTOR	1.00	1.00
ACTUAL CAPACITY	816	958

DATE:03-22-1994 TIME:09:34:57
AM HEATH/PARKER EX

STEP 2 LEFT TURNS FROM	B:HEATH WB	A:HEATH EB
CONFLICTING FLOWS	379	449
CRITICAL GAPS	5.0	5.0
CAPACITY	815	755
CAPACITY USED	1%	20%
IMPEDANCE FACTOR	1.00	0.86
ACTUAL CAPACITY	815	755

STEP 3 THRU MOVES FROM	C:PARKER NB	D:PARKER SB
CONFLICTING FLOWS	973	750
CRITICAL GAPS	5.5	5.5
CAPACITY	341	457
CAPACITY USED	3%	0%
IMPEDANCE FACTOR	0.99	1.00
ACTUAL CAPACITY	291	390

STEP 4 LEFT TURNS FROM	C:PARKER NB	D:PARKER SB
CONFLICTING FLOWS	973	761
CRITICAL GAPS	6.0	6.0
CAPACITY	285	386
ACTUAL CAPACITY	243	325

SUMMARY OF LEVEL OF SERVICE BY MOVEMENT

MOVEMENT	DEMAND	CAPACITY	RESERVE	LOS	AVG DEL(SEC)	AVG QU
LT FROM A:	154	755	601	A	5.99	0.2
LT FROM B:	7	815	808	A	4.46	0.0
ALL MOVES FROM C:	12	339	328	B	10.99	0.0

CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 10: UNSIGNALIZED - 4 APPROACHES (PAGE 1 OF 2)
DATE:03-10-1994 TIME:15:14:20
PM HEATH/PARKER #1

LAST DATASETS LOADED OR SAVED
VOLUME=1PM1EX GEOMETRICS=1EX1

```
KEY:    D
        |
     A- -B
        |
        C
```

GENERAL CHARACTERISTICS
POPULATION GREATER THAN 250,000: NO
CONTROLS: FROM C: YIELD
FROM D: YIELD
PREVAILING SPEED: 30 MPH
MAIN STREET # OF LANES: 2 LANES
MAIN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: NO
MAIN STREET APPROACH B - EXCLUSIVE RIGHT TURN LANE: NO

MINOR STREET LANES

APPROACH: C: PARKER NB
EXCLUSIVE LEFT TURN LANES: NO
EXCLUSIVE RIGHT TURN LANES: NO
LARGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
RIGHT TURN ACCELERATION LANE ON MAJOR: NO

APPROACH: D: PARKER SB
EXCLUSIVE LEFT TURN LANES: NO
EXCLUSIVE RIGHT TURN LANES: NO
LARGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
RIGHT TURN ACCELERATION LANE ON MAJOR: NO

SIGHT DISTANCE RESTRICTIONS (in seconds)

APPROACH	A: HEATH EB	B: HEATH WB	C: PARKER NB	D: PARKER SB
LEFTS	0.00	0.00	0.00	0.00
THRUS	0.00	0.00	0.00	0.00
RIGHTS	0.00	0.00	0.00	0.00

APPROACH	A: HEATH EB			B: HEATH WB			C: PARKER NB			D: PARKER SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
VOLUME	152	480	9	11	0	291	0	8	10	0	0	0
PHF	0.97			0.92			0.41			0.90		
ADJ VOLUME	157	495	9	12	0	316	0	20	24	0	0	0
PERCENT GRADE	0.00			0.00			0.00					
PASS CAR/HR	172			13			0	21	27	0	0	0

STEP 1 RIGHT TURNS FROM	C:PARKER NB	D:PARKER SB
CONFLICTING FLOWS	499	158
CRITICAL GAPS	5.0	5.0
CAPACITY	715	1026
CAPACITY USED	4%	0%
IMPEDANCE FACTOR	0.98	1.00
ACTUAL CAPACITY	715	1026

DATE:03-10-1994 TIME:15:14:20
PM HEATH/PARKER #1

STEP 2 LEFT TURNS FROM	B:HEATH WB	A:HEATH EB
CONFLICTING FLOWS	504	316
CRITICAL GAPS	5.0	5.0
CAPACITY	711	871
CAPACITY USED	2%	20%
IMPEDANCE FACTOR	0.99	0.86
ACTUAL CAPACITY	711	871

STEP 3 THRU MOVES FROM	C:PARKER NB	D:PARKER SB
CONFLICTING FLOWS	984	831
CRITICAL GAPS	5.5	5.5
CAPACITY	336	412
CAPACITY USED	6%	0%
IMPEDANCE FACTOR	0.96	1.00
ACTUAL CAPACITY	287	352

STEP 4 LEFT TURNS FROM	C:PARKER NB	D:PARKER SB
CONFLICTING FLOWS	984	875
CRITICAL GAPS	6.0	6.0
CAPACITY	280	328
ACTUAL CAPACITY	239	265

SUMMARY OF LEVEL OF SERVICE BY MOVEMENT

MOVEMENT	DEMAND	CAPACITY	RESERVE	LOS	AVG DEL(SEC)	AVG QUI
LT FROM A:	172	871	699	A	5.15	0.2
LT FROM B:	13	711	698	A	5.16	0.0
ALL MOVES FROM C:	48	430	381	B	9.44	0.1

CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 10: UNSIGNALIZED - 4 APPROACHES (PAGE 1 OF 2)
DATE:03-22-1994 TIME:09:39:50
AM HEATH/PARKER 2EX

LAST DATASETS LOADED OR SAVED
VOLUME=1AM2EX GEOMETRICS=1AM2EX

```
KEY:    D
        |
     A-   -B
        |
        C
```

GENERAL CHARACTERISTICS
POPULATION GREATER THAN 250,000: NO
CONTROLS: FROM C: YIELD
FROM D: YIELD
PREVAILING SPEED: 30 MPH
MAIN STREET # OF LANES: 4 LANES
MAIN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: NO
MAIN STREET APPROACH B - EXCLUSIVE RIGHT TURN LANE: YES

MINOR STREET LANES

APPROACH: C: NEW HEATH WB
EXCLUSIVE LEFT TURN LANES: NO
EXCLUSIVE RIGHT TURN LANES: NO
LARGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
RIGHT TURN ACCELERATION LANE ON MAJOR: NO

APPROACH: D: HEATH ST
EXCLUSIVE LEFT TURN LANES: NO
EXCLUSIVE RIGHT TURN LANES: NO
LARGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
RIGHT TURN ACCELERATION LANE ON MAJOR: NO

SIGHT DISTANCE RESTRICTIONS (in seconds)

APPROACH	A: PARKER NB	B: PARKER SB	C: NEW HEATH W	D: HEATH ST
LEFTS	0.00	0.00	0.00	0.00
THRUS	0.00	0.00	0.00	0.00
RIGHTS	0.00	0.00	0.00	0.00

APPROACH	A: PARKER NB			B: PARKER SB			C: NEW HEATH W			D: HEATH ST		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
VOLUME	324	72	118	16	2	137	0	51	11	5	5	5
PHF	0.84			0.81			0.86			0.81		
ADJ VOLUME	386	86	140	20	2	169	0	59	13	6	6	6
PERCENT GRADE	0.00			0.00			0.00					
PASS CAR/HR	424			22			0	65	14	7	7	7

STEP 1 RIGHT TURNS FROM	C:NEW HEATH WB	D:HEATH ST
CONFLICTING FLOWS	113	1
CRITICAL GAPS	5.0	5.0
CAPACITY	1073	1199
CAPACITY USED	1%	1%
IMPEDANCE FACTOR	0.99	1.00
ACTUAL CAPACITY	1073	1199

DATE:03-22-1994 TIME:09:39:50
AM HEATH/PARKER 2EX

STEP 2 LEFT TURNS FROM	B:PARKER SB	A:PARKER NB
CONFLICTING FLOWS	226	2
CRITICAL GAPS	5.5	5.5
CAPACITY	862	1105
CAPACITY USED	3%	38%
IMPEDANCE FACTOR	0.99	0.69
ACTUAL CAPACITY	862	1105

STEP 3 THRU MOVES FROM	C:NEW HEATH WB	D:HEATH ST
CONFLICTING FLOWS	564	634
CRITICAL GAPS	6.0	6.0
CAPACITY	505	460
CAPACITY USED	13%	1%
IMPEDANCE FACTOR	0.92	0.99
ACTUAL CAPACITY	345	314

STEP 4 LEFT TURNS FROM	C:NEW HEATH WB	D:HEATH ST
CONFLICTING FLOWS	576	706
CRITICAL GAPS	6.5	6.5
CAPACITY	436	360
ACTUAL CAPACITY	296	224

SUMMARY OF LEVEL OF SERVICE BY MOVEMENT

MOVEMENT	DEMAND	CAPACITY	RESERVE	LOS	AVG DEL(SEC)	AVG QU
LT FROM A:	424	1105	680	A	5.29	0.6
LT FROM B:	22	862	841	A	4.28	0.0
ALL MOVES FROM C:	79	393	313	B	11.49	0.2
ALL MOVES FROM D:	20	354	334	B	10.79	0.0

CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 10: UNSIGNALIZED - 4 APPROACHES (PAGE 1 OF 2)
DATE:03-10-1994 TIME:15:27:41
PM HEATH/PARKER #2

LAST DATASETS LOADED OR SAVED
VOLUME=1PM2EX GEOMETRICS=1EX2

```
KEY:    D
        |
     A-   -B
        |
        C
```

GENERAL CHARACTERISTICS
POPULATION GREATER THAN 250,000: NO
CONTROLS: FROM C: YIELD
FROM D: YIELD
PREVAILING SPEED: 30 MPH
MAIN STREET # OF LANES: 4 LANES
MAIN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: NO
MAIN STREET APPROACH B - EXCLUSIVE RIGHT TURN LANE: YES

MINOR STREET LANES

APPROACH: C: NEW HEATH WB
EXCLUSIVE LEFT TURN LANES: NO
EXCLUSIVE RIGHT TURN LANES: NO
LARGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
RIGHT TURN ACCELERATION LANE ON MAJOR: NO

APPROACH: D: HEATH ST
EXCLUSIVE LEFT TURN LANES: NO
EXCLUSIVE RIGHT TURN LANES: NO
LARGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
RIGHT TURN ACCELERATION LANE ON MAJOR: NO

SIGHT DISTANCE RESTRICTIONS (in seconds)

APPROACH	A: PARKER NB	B: PARKER SB	C: NEW HEATH W	D: HEATH ST
LEFTS	0.00	0.00	0.00	0.00
THRUS	0.00	0.00	0.00	0.00
RIGHTS	0.00	0.00	0.00	0.00

APPROACH	A: PARKER NB			B: PARKER SB			C: NEW HEATH W			D: HEATH ST		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
VOLUME	284	58	109	13	2	307	0	67	6	5	5	5
PHF	0.92			0.89			0.63			0.89		
ADJ VOLUME	309	63	118	15	2	345	0	106	10	6	6	6
PERCENT GRADE	0.00			0.00			0.00					
PASS CAR/HR	340			16			0	117	10	6	6	6

STEP 1 RIGHT TURNS FROM	C:NEW HEATH WB	D:HEATH ST
CONFLICTING FLOWS	91	1
CRITICAL GAPS	5.0	5.0
CAPACITY	1097	1199
CAPACITY USED	1%	1%
IMPEDANCE FACTOR	1.00	1.00
ACTUAL CAPACITY	1097	1199

DATE:03-10-1994 TIME:15:27:41
PM HEATH/PARKER #2

STEP 2 LEFT TURNS FROM	B:PARKER SB	A:PARKER NB
CONFLICTING FLOWS	182	2
CRITICAL GAPS	5.5	5.5
CAPACITY	907	1105
CAPACITY USED	2%	31%
IMPEDANCE FACTOR	0.99	0.76
ACTUAL CAPACITY	907	1105

STEP 3 THRU MOVES FROM	C:NEW HEATH WB	D:HEATH ST
CONFLICTING FLOWS	448	507
CRITICAL GAPS	6.0	6.0
CAPACITY	589	545
CAPACITY USED	20%	1%
IMPEDANCE FACTOR	0.86	1.00
ACTUAL CAPACITY	447	413

STEP 4 LEFT TURNS FROM	C:NEW HEATH WB	D:HEATH ST
CONFLICTING FLOWS	459	623
CRITICAL GAPS	6.5	6.5
CAPACITY	516	407
ACTUAL CAPACITY	389	265

SUMMARY OF LEVEL OF SERVICE BY MOVEMENT

MOVEMENT	DEMAND	CAPACITY	RESERVE	LOS	AVG DEL(SEC)	AVG QUI
LT FROM A:	340	1105	765	A	4.70	0.44
LT FROM B:	16	907	891	A	4.04	0.02
ALL MOVES FROM C:	127	470	342	B	10.51	0.37
ALL MOVES FROM D:	19	427	408	A	8.82	0.05

CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 1 of 2)
DATE:03-22-1994 TIME:09:45:32
AM HEATH/PARKER 3EX

LAST DATASETS LOADED OR SAVED
VOLUME=1AM3EX GEOMETRICS=1AM3EX

```
KEY: A- -B
       |
       C
```

GENERAL CHARACTERISTICS
POPULATION GREATER THAN 250,000: NO
CONTROLS: FROM C: YIELD
PREVAILING SPEED: 30 MPH
MAIN STREET # OF LANES: 2 LANES
MAIN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: N

MINOR STREET LANES
APPROACH: C: HEATH WB
SHARED LEFT AND RIGHT TURN LANE: YES
LARGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
RIGHT TURN ACCELERATION LANE ON MAJOR: NO

SIGHT DISTANCE RESTRICTIONS (in seconds)

APPROACH	A:	B: HEATH EB	C: HEATH WB
LEFTS	0.00	0.00	0.00
THRUS	0.00	0.00	0.00
RIGHTS	0.00	0.00	0.00

APPROACH	A:			B: HEATH EB			C: HEATH WB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT
VOLUME	0	1	1	0	478	0	68	0	439
PHF	0.90			0.92			0.81		
ADJ VOLUME	0	1	1	0	520	0	84	0	542
PERCENT GRADE	0.00			0.00			0.00		
PASS CAR/HR	0			0			92	0	596

STEP 1 RIGHT TURNS FROM	C:HEATH WB
CONFLICTING FLOWS	2
CRITICAL GAPS	5.0
CAPACITY	1198
ACTUAL CAPACITY	1198

STEP 2 LEFT TURNS FROM	B:HEATH EB
CONFLICTING FLOWS	2
CRITICAL GAPS	5.0
CAPACITY	1197
CAPACITY USED	0%
IMPEDANCE FACTOR	1.00
ACTUAL CAPACITY	1197

DATE:03-22-1994 TIME:09:45:32
AM HEATH/PARKER 3EX

STEP 3 LEFT TURNS FROM	C:HEATH WB
CONFLICTING FLOWS	521
CRITICAL GAPS	6.0
CAPACITY	535
ACTUAL CAPACITY	535

SUMMARY OF LEVEL OF SERVICE BY MOVEMENT

MOVEMENT	DEMAND	CAPACITY	RESERVE	LOS	AVG DEL(SEC)	AVG QU
ALL MOVES FROM C:	689	1027	339	B	10.63	2.0

```
CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 1 of 2)
DATE:03-10-1994              TIME:15:33:04
PM HEATH/PARKER #3


LAST DATASETS LOADED OR SAVED
VOLUME=1PM3EX     GEOMETRICS=1EX3
KEY: A- -B
       |
       C
GENERAL CHARACTERISTICS
POPULATION GREATER THAN 250,000: NO
CONTROLS: FROM C: YIELD
PREVAILING SPEED:  30  MPH
MAIN STREET # OF LANES: 2 LANES
MAIN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: N

MINOR STREET LANES
APPROACH: C: HEATH WB
SHARED LEFT AND RIGHT TURN LANE: YES
LARGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
RIGHT TURN ACCELERATION LANE ON MAJOR: NO


SIGHT DISTANCE RESTRICTIONS (in seconds)
APPROACH         A:              B: HEATH EB    C: HEATH WB
LEFTS              0.00            0.00           0.00
THRUS              0.00            0.00           0.00
RIGHTS             0.00            0.00           0.00


APPROACH         A:              B: HEATH EB    C: HEATH WB
                  LT   TH   RT   LT   TH   RT   LT   TH   RT
VOLUME             0    1    1    0  641    0  193    0  465
PHF                0.90           0.97           0.80
ADJ VOLUME         0    1    1    0  661    0  241    0  581
PERCENT GRADE      0.00           0.00           0.00
PASS CAR/HR        0              0            265    0  639


STEP 1 RIGHT TURNS FROM     C:HEATH WB
CONFLICTING FLOWS                       2
CRITICAL GAPS                         5.0
CAPACITY                             1198
ACTUAL CAPACITY                      1198


STEP 2 LEFT TURNS FROM     B:HEATH EB
CONFLICTING FLOWS                       2
CRITICAL GAPS                         5.0
CAPACITY                             1197
CAPACITY USED                          0%
IMPEDANCE FACTOR                     1.00
ACTUAL CAPACITY                      1197
```

PM HEATH/PARKER #3

STEP 3 LEFT TURNS FROM	C:HEATH WB
CONFLICTING FLOWS	662
CRITICAL GAPS	6.0
CAPACITY	442
ACTUAL CAPACITY	442

SUMMARY OF LEVEL OF SERVICE BY MOVEMENT

MOVEMENT	DEMAND	CAPACITY	RESERVE	LOS	AVG DEL(SEC)	AVG Q
ALL MOVES FROM C:	905	798	-107	F	INFINITE	INFINI

CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 1 of 2)
DATE:03-02-1994 TIME:13:03:54
S.HUNTINGTON AVE/HEATH ST-AMEX

LAST DATASETS LOADED OR SAVED
VOLUME=2AM93EX GEOMETRICS=2AM93EX

```
KEY: A- -B
      |
      C
```

GENERAL CHARACTERISTICS
POPULATION GREATER THAN 250,000: YES
CONTROLS: FROM C: YIELD
PREVAILING SPEED: 35 MPH
MAIN STREET # OF LANES: 4 LANES
MAIN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: Y

MINOR STREET LANES
APPROACH: C: HEATH ST. WB
SHARED LEFT AND RIGHT TURN LANE: YES
LARGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: YES
RIGHT TURN ACCELERATION LANE ON MAJOR: YES

SIGHT DISTANCE RESTRICTIONS (in seconds)

APPROACH	A: S.HUNT-NB	B: S.HUNT-SB	C: HEATH ST. W
LEFTS	0.00	0.00	0.00
THRUS	0.00	0.00	0.00
RIGHTS	0.00	0.00	0.00

APPROACH	A: S.HUNT-NB			B: S.HUNT-SB			C: HEATH ST. W		
	LT	TH	RT	LT	TH	RT	LT	TH	RT
VOLUME	0	427	212	221	304	0	105	0	197
PHF	0.90			0.97			0.86		
ADJ VOLUME	0	474	236	228	313	0	122	0	229
PERCENT GRADE	0.00			0.00			0.00		
PERCENT CYCLES	0.00			0.00			0.00		
PASSENGER CARS	94.00			99.00			98.00		
PERCENT LT TRU	0.00			0.00			0.00		
PERCENT HV TRU	6.00			1.00			2.00		
PASS CAR/HR	0			230			125	0	234

STEP 1 RIGHT TURNS FROM	C:HEATH ST. WB
CONFLICTING FLOWS	237
CRITICAL GAPS	4.1
CAPACITY	1164
ACTUAL CAPACITY	1164

STEP 2 LEFT TURNS FROM	B:S.HUNT-SB
CONFLICTING FLOWS	474
CRITICAL GAPS	5.1
CAPACITY	715
CAPACITY USED	32%
IMPEDANCE FACTOR	0.75
ACTUAL CAPACITY	715

DATE:03-02-1994 TIME:13:03:54
S.HUNTINGTON AVE/HEATH ST-AMEX

STEP 3 LEFT TURNS FROM	C:HEATH ST. WB
CONFLICTING FLOWS	1133
CRITICAL GAPS	6.2
CAPACITY	207
ACTUAL CAPACITY	155

SUMMARY OF LEVEL OF SERVICE BY MOVEMENT

MOVEMENT	DEMAND	CAPACITY	RESERVE	LOS	AVG DEL(SEC)	AVG QUEUE
LT FROM B:	230	715	485	A	7.42	0.47
ALL MOVES FROM C:	358	357	-1	F	INFINITE	INFINITE

CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 1 of 2)
DATE:03-02-1994 TIME:13:04:58
S.HUNTINGTON AVE/HEATH ST-PMEX

LAST DATASETS LOADED OR SAVED
VOLUME=2PM93EX GEOMETRICS=2PM93EX

```
KEY: A- -B
       |
       C
```

GENERAL CHARACTERISTICS
POPULATION GREATER THAN 250,000: YES
CONTROLS: FROM C: YIELD
PREVAILING SPEED: 35 MPH
MAIN STREET # OF LANES: 4 LANES
MAIN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: Y

MINOR STREET LANES
APPROACH: C: HEATH WB
SHARED LEFT AND RIGHT TURN LANE: YES
LARGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: YES
RIGHT TURN ACCELERATION LANE ON MAJOR: YES

SIGHT DISTANCE RESTRICTIONS (in seconds)

APPROACH	A: S.HUNT- NB	B: S.HUNT-SB	C: HEATH WB
LEFTS	0.00	0.00	0.00
THRUS	0.00	0.00	0.00
RIGHTS	0.00	0.00	0.00

APPROACH	A: S.HUNT- NB			B: S.HUNT-SB			C: HEATH WB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT
VOLUME	0	401	81	175	409	0	189	0	169
PHF	0.88			0.90			0.92		
ADJ VOLUME	0	456	92	194	454	0	205	0	184
PERCENT GRADE	0.00			0.00			0.00		
PERCENT CYCLES	0.00			0.00			0.00		
PASSENGER CARS	98.00			99.00			99.00		
PERCENT LT TRU	0.00			0.00			0.00		
PERCENT HV TRU	2.00			1.00			1.00		
PASS CAR/HR	0			196			207	0	186

STEP 1 RIGHT TURNS FROM	C:HEATH WB
CONFLICTING FLOWS	228
CRITICAL GAPS	4.1
CAPACITY	1173
ACTUAL CAPACITY	1173

STEP 2 LEFT TURNS FROM	B:S.HUNT-SB
CONFLICTING FLOWS	456
CRITICAL GAPS	5.1
CAPACITY	731
CAPACITY USED	27%
IMPEDANCE FACTOR	0.80
ACTUAL CAPACITY	731

DATE:03-02-1994 TIME:13:04:58
S.HUNTINGTON AVE/HEATH ST-PMEX

STEP 3 LEFT TURNS FROM	C:HEATH WB
CONFLICTING FLOWS	1151
CRITICAL GAPS	6.2
CAPACITY	201
ACTUAL CAPACITY	161

SUMMARY OF LEVEL OF SERVICE BY MOVEMENT

MOVEMENT	DEMAND	CAPACITY	RESERVE	LOS	AVG DEL(SEC)	AVG QUEUE
LT FROM B:	196	731	534	A	6.74	0.37
ALL MOVES FROM C:	393	272	-122	F	INFINITE	INFINITE

CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
S.HUNTINGTON AVE/ HUNTINGTON AVE
3-AM 94 EXISTING
date:03-02-1994 time:13:07:07
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=3AM94EX GEOMETRICS=3EX SIGNAL=3AM94EX
LOCATED IN CBD:Y

VOLUME & GEOMETRICS

	VOLUMES			# OF LANES			LANE WIDTH			CROSS
DIR	LT	TH	RT	LT	TH	RT	LT	TH	RT	WALK
EB	0	1048	319	0	2	0	0.0	12.0	0.0	50
WB	149	468	0	1	1	0	12.0	12.0	0.0	60
NB	312	0	221	1	0	1	12.0	0.0	12.0	50
SB	0	0	0	0	0	0	0.0	0.0	0.0	0

TRAFFIC & ROADWAY CONDITIONS

			ADJ	PARK			PEDESTRIANS			ARR
DIR	GRADE	%HV	Y/N	MOVES	BUSES	PHF	CROSS	BUT	MIN TIME	TYPE
EB	0.0%	5.0%	N	0	0	.940	100	Y	22.0	3
WB	0.0%	7.0%	N	0	0	.910	100	Y	22.0	3
NB	0.0%	4.0%	N	0	10	.880	100	Y	19.5	3
SB	0.0%	0.0%		0	0	.000	0		19.5	0

PHASINGS

	EASTBOUND				WESTBOUND				NORTHBOUND				SOUTHBOUND				GREEN	Y+R	PRE/ACT
	l	t	r	p	l	t	r	p	l	t	r	p	l	t	r	p			
1					*	*					*						10.5	4	A
2		*	*			*											47.9	4	A
3				*				*				*				*	0.0	7	A
4			*			*			*		*						22.5	4	A

CYCLE= 100.0

VOLUME ADJUSTMENT WORKSHEET
PART 1 (MOVEMENT ADJUSTMENTS)

DIR	LTV	THV	RTV	PHF	LTFR	THFR	RTFR
EB	0	1048	319	.940	0	1115	339
WB	149	468	0	.910	164	514	0
NB	312	0	221	.880	355	0	251
SB	0	0	0	.000	0	0	0

PART 2 (LANE GROUP ADJUSTMENTS)

DIR	LN GROUP	FLOW	N	LU	v	Plt	Prt
EB	TH-RT	1454	2	1.05	1527	0.00	0.23
WB	LT	164	1	1.00	164	1.00	0.00
WB	TH	514	1	1.00	514	0.00	0.00
NB	LT	355	1	1.00	355	1.00	0.00
NB	RT	251	1	1.00	251	0.00	1.00

PART 3 (OPPOSING VOLUME ADJUSTMENTS)

LEFT TURN	OPPOSING APPROACH									
BEING OPPOSED	VOLUMES			% OPPOSING LEFT TURN			# LANES			OPPOSING
	LT	TH	RT	LT	TH	RT	LT	TH	RT	VOLUME
WESTBOUND	0	1115	339	0	0	0	0	2	0	0
NORTHBOUND	0	0	0	0	0	0	0	0	0	0

SATURATION FLOW ADJUSTMENT WORKSHEET

DIR	LN GROUP	IDEAL	N	Fwid	Fhv	Fgr	Fpark	Fbus	Farea	Frt	Flt	s
EB	TH-RT	1800	2	1.000	0.976	1.000	1.000	1.000	0.900	0.965	1.000	3050
WB	LT	1800	1	1.000	0.966	1.000	1.000	1.000	0.900	1.000	0.950	1487
WB	TH	1800	1	1.000	0.966	1.000	1.000	1.000	0.900	1.000	1.000	1565
NB	LT	1800	1	1.000	0.980	1.000	1.000	1.000	0.900	1.000	0.950	1509
NB	RT	1800	1	1.000	0.980	1.000	1.000	0.958	0.900	0.850	1.000	1294

CAPACITY ANALYSIS WORKSHEET

DIR	LN GROUP	v	s	v/s	g/C	c	v/c	CRITICAL
EB	TH-RT	1527	3050	0.50	0.48	1463	1.04	*
WB	LT	164	1487	0.11	0.11	157	1.04	*
WB	TH	514	1565	0.33	0.89	1393	0.37	
NB	LT	355	1509	0.23	0.23	340	1.04	*
NB	RT	251	1294	0.19	0.37	479	0.52	

CYCLE=100.0 LOST=19.0 SUM V/S CRIT= 0.85 TOTAL V/C= 1.04

LEVEL OF SERVICE WORKSHEET

DIR	LN GROUP	v/c	g/C	C	d1	c	d2	PF	Delay	LOS	Avg Q	95% Q
EB	TH-RT	1.04	0.48	100.0	20.62	1463	30.11	0.85	43.12	E	27.9	
WB	LT	1.04	0.11	100.0	34.17	157	70.41	1.00	104.58	F	6.8	
WB	TH	0.37	0.89	100.0	0.68	1393	0.08	0.85	0.65	A	1.6	
NB	LT	1.04	0.23	100.0	29.83	340	50.95	1.00	80.78	F	11.8	
NB	RT	0.52	0.37	100.0	18.68	479	0.86	0.85	16.61	C	4.4	

DIR	Delay	LOS
EB	43.12	E
WB	25.75	D
NB	54.17	E

INTERSECTION DELAY = 41.31 INTERSECTION LOS=E

THE CYCLE LENGTH WITHIN THE BOUNDS OF 100 TO 100 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 100.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE 173.0 SECONDS
THE EXISTING TIMING IS OPTIMAL

CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
S.HUNTINGTON AVE/ HUNTINGTON AVE
3-PM 94 EXISTING
date:02-28-1994 time:13:46:50
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=3PM94EX GEOMETRICS=3EX SIGNAL=3PM94EX
LOCATED IN CBD:Y

VOLUME & GEOMETRICS

	VOLUMES			# OF LANES			LANE WIDTH			CROSS
DIR	LT	TH	RT	LT	TH	RT	LT	TH	RT	WALK
EB	0	629	323	0	2	0	0.0	12.0	0.0	50
WB	243	877	0	1	1	0	12.0	12.0	0.0	60
NB	312	0	165	1	0	1	12.0	0.0	12.0	50
SB	0	0	0	0	0	0	0.0	0.0	0.0	0

TRAFFIC & ROADWAY CONDITIONS

			ADJ PARK				PEDESTRIANS			ARR
DIR	GRADE	%HV	Y/N	MOVES	BUSES	PHF	CROSS	BUT	MIN TIME	TYPE
EB	0.0%	7.0%	N	0	0	.940	100	Y	22.0	3
WB	0.0%	5.0%	N	0	0	.930	100	Y	22.0	3
NB	0.0%	4.0%	N	0	10	.830	100	Y	19.5	3
SB	0.0%	0.0%		0	0	.000	0		19.5	0

PHASINGS

	EASTBOUND				WESTBOUND				NORTHBOUND				SOUTHBOUND				GREEN	Y+R	PRE/ACT
	l	t	r	p	l	t	r	p	l	t	r	p	l	t	r	p			
1					*	*					*						18.0	4	A
2		*	*			*											37.1	4	A
3				*				*				*				*	0.0	7	A
4			*			*			*		*						25.8	4	A

CYCLE= 100.0

VOLUME ADJUSTMENT WORKSHEET
PART 1 (MOVEMENT ADJUSTMENTS)

DIR	LTV	THV	RTV	PHF	LTFR	THFR	RTFR
EB	0	629	323	.940	0	669	344
WB	243	877	0	.930	261	943	0
NB	312	0	165	.830	376	0	199
SB	0	0	0	.000	0	0	0

PART 2 (LANE GROUP ADJUSTMENTS)

DIR	LN GROUP	FLOW	N	LU	v	Plt	Prt
EB	TH-RT	1013	2	1.05	1063	0.00	0.34
WB	LT	261	1	1.00	261	1.00	0.00
WB	TH	943	1	1.00	943	0.00	0.00
NB	LT	376	1	1.00	376	1.00	0.00
NB	RT	199	1	1.00	199	0.00	1.00

PART 3 (OPPOSING VOLUME ADJUSTMENTS)

LEFT TURN	OPPOSING APPROACH									
BEING OPPOSED	VOLUMES			% OPPOSING LEFT TURN			# LANES			OPPOSING
	LT	TH	RT	LT	TH	RT	LT	TH	RT	VOLUME
WESTBOUND	0	669	344	0	0	0	0	2	0	0
NORTHBOUND	0	0	0	0	0	0	0	0	0	0

SATURATION FLOW ADJUSTMENT WORKSHEET

DIR	LN GROUP	IDEAL	N	Fwid	Fhv	Fgr	Fpark	Fbus	Farea	Frt	Flt	s
EB	TH-RT	1800	2	1.000	0.966	1.000	1.000	1.000	0.900	0.949	1.000	2971
WB	LT	1800	1	1.000	0.976	1.000	1.000	1.000	0.900	1.000	0.950	1501
WB	TH	1800	1	1.000	0.976	1.000	1.000	1.000	0.900	1.000	1.000	1580
NB	LT	1800	1	1.000	0.980	1.000	1.000	1.000	0.900	1.000	0.950	1509
NB	RT	1800	1	1.000	0.980	1.000	1.000	0.958	0.900	0.850	1.000	1294

CAPACITY ANALYSIS WORKSHEET

DIR	LN GROUP	v	s	v/s	g/C	c	v/c	CRITICAL
EB	TH-RT	1063	2971	0.36	0.37	1103	0.96	*
WB	LT	261	1501	0.17	0.18	271	0.96	*
WB	TH	943	1580	0.60	0.89	1407	0.67	
NB	LT	376	1509	0.25	0.26	390	0.96	*
NB	RT	199	1294	0.15	0.48	619	0.32	

CYCLE=100.0 LOST=19.0 SUM V/S CRIT= 0.78 TOTAL V/C= 0.96

LEVEL OF SERVICE WORKSHEET

DIR	LN GROUP	v/c	g/C	C	d1	c	d2	PF	Delay	LOS	Avg Q	95% Q
EB	TH-RT	0.96	0.37	100.0	23.40	1103	14.13	0.85	31.90	D	17.8	
WB	LT	0.96	0.18	100.0	30.90	271	33.07	1.00	63.97	F	7.6	
WB	TH	0.67	0.89	100.0	1.14	1407	0.88	0.85	1.72	A	2.9	
NB	LT	0.96	0.26	100.0	27.84	390	26.77	1.00	54.61	E	9.6	
NB	RT	0.32	0.48	100.0	12.20	619	0.11	0.85	10.46	B	2.9	

DIR	Delay	LOS
EB	31.90	D
WB	15.23	C
NB	39.33	D

INTERSECTION DELAY = 26.34 INTERSECTION LOS=D

THE CYCLE LENGTH WITHIN THE BOUNDS OF 100 TO 100 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 100.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE 106.9 SECONDS
THE EXISTING TIMING IS OPTIMAL

CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
HUNTINGTON AVE/PARKER HILL AVE
4-AM 94 EXISTING]
date:02-28-1994 time:13:48:28
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=4AM94EX GEOMETRICS=4EX SIGNAL=4AM94EX
LOCATED IN CBD:Y
VOLUME & GEOMETRICS

	VOLUMES			# OF LANES			LANE WIDTH			CROSS
DIR	LT	TH	RT	LT	TH	RT	LT	TH	RT	WALK
EB	0	878	54	0	2	0	0.0	13.0	0.0	50
WB	60	437	0	0	2	0	0.0	14.0	0.0	50
NB	41	0	47	0	1	0	0.0	11.0	0.0	25
SB	0	0	0	0	0	0	0.0	0.0	0.0	0

TRAFFIC & ROADWAY CONDITIONS

			ADJ	PARK			PEDESTRIANS			ARR
DIR	GRADE	%HV	Y/N	MOVES	BUSES	PHF	CROSS	BUT	MIN TIME	TYPE
EB	0.0%	7.0%	N	0	7	.910	100	Y	19.5	3
WB	0.0%	14.0%	N	0	7	.910	100	Y	19.5	3
NB	0.0%	11.0%	N	0	0	.810	50	Y	9.3	3
SB	0.0%	0.0%		0	0	.000	0		9.3	0

PHASINGS

	EASTBOUND				WESTBOUND				NORTHBOUND				SOUTHBOUND				GREEN	Y+R	PRE/ACT
	l	t	r	p	l	t	r	p	l	t	r	p	l	t	r	p			
1		*	*		*	*						*					60.0	4	A
2									*		*						22.0	4	A
3				*				*				*					0.0	10	A

CYCLE= 100.0

VOLUME ADJUSTMENT WORKSHEET
PART 1 (MOVEMENT ADJUSTMENTS)

DIR	LTV	THV	RTV	PHF	LTFR	THFR	RTFR
EB	0	878	54	.910	0	965	59
WB	60	437	0	.910	66	480	0
NB	41	0	47	.810	51	0	58
SB	0	0	0	.000	0	0	0

PART 2 (LANE GROUP ADJUSTMENTS)

DIR	LN GROUP	FLOW	N	LU	v	Plt	Prt
EB	TH-RT	1024	2	1.05	1075	0.00	0.06
WB	LT-TH	546	2	1.05	573	0.12	0.00
NB	LT-RT	109	1	1.00	109	0.47	0.53

PART 3 (OPPOSING VOLUME ADJUSTMENTS)

LEFT TURN	OPPOSING APPROACH									
BEING OPPOSED	VOLUMES			% OPPOSING LEFT TURN			# LANES			OPPOSING
	LT	TH	RT	LT	TH	RT	LT	TH	RT	VOLUME
WESTBOUND	0	965	59	100	100	100	0	2	0	1024
NORTHBOUND	0	0	0	0	0	0	0	0	0	0

SATURATION FLOW ADJUSTMENT WORKSHEET

DIR	LN GROUP	IDEAL	N	Fwid	Fhv	Fgr	Fpark	Fbus	Farea	Frt	Flt	s
EB	TH-RT	1800	2	1.033	0.966	1.000	1.000	0.985	0.900	0.990	1.000	3156
WB	LT-TH	1800	2	1.067	0.935	1.000	1.000	0.985	0.900	1.000	0.649	2065
NB	LT-RT	1800	1	0.967	0.948	1.000	1.000	1.000	0.900	0.802	0.815	971

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT
INPUT VARIABLES

DIR	C	G	N	Va	Vm	Vlt	Plt	No	Vo	Plto
WB	100	60	2	546	546	66	0.12	2	1024	0.00

CALCULATIONS

DIR	Sop	Yo	Gu	Fs	Pl	Gq	Pt	Gf	El	Fm	Flt
WB	3600	0.284	44.096	0.235	0.608	15.904	0.392	1.287	4.789	0.297	0.649

CAPACITY ANALYSIS WORKSHEET

DIR	LN GROUP	v	s	v/s	g/C	c	v/c	CRITICAL
EB	TH-RT	1075	3156	0.34	0.60	1893	0.57	*
WB	LT-TH	573	2065	0.28	0.60	1239	0.46	
NB	LT-RT	109	971	0.11	0.22	214	0.51	*

CYCLE=100.0 LOST=18.0 SUM V/S CRIT= 0.45 TOTAL V/C= 0.55

LEVEL OF SERVICE WORKSHEET

DIR	LN GROUP	v/c	g/C	C	d1	c	d2	PF	Delay	LOS	Avg Q	95% Q
EB	TH-RT	0.57	0.60	100.0	9.22	1893	0.31	0.85	8.10	B	11.4	
WB	LT-TH	0.46	0.60	100.0	8.42	1239	0.21	0.85	7.33	B	6.1	
NB	LT-RT	0.51	0.22	100.0	26.03	214	1.67	1.00	27.71	D	2.4	

DIR	Delay	LOS
EB	8.10	B
WB	7.33	B
NB	27.71	D

INTERSECTION DELAY = 9.06 INTERSECTION LOS=B

THE CYCLE LENGTH WITHIN THE BOUNDS OF 100 TO 100 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 100.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE 34.4 SECONDS
for chosen cycle length 100.0
suggested timing phase 1 is 61.7 secs green, 4.0 secs yellow + red clear
suggested timing phase 2 is 20.3 secs green, 4.0 secs yellow + red clear
suggested timing phase 3 is 0.0 secs green, 10.0 secs yellow + red clear

CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
HUNTINGTON AVE/PARKER HILL AVE
4-PM 94 EXISTING
date:02-28-1994 time:13:49:31
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=4PM94EX GEOMETRICS=4EX SIGNAL=4PM94EX
LOCATED IN CBD:Y

VOLUME & GEOMETRICS

	VOLUMES			# OF LANES			LANE WIDTH			CROSS
DIR	LT	TH	RT	LT	TH	RT	LT	TH	RT	WALK
EB	0	731	49	0	2	0	0.0	13.0	0.0	50
WB	64	845	0	0	2	0	0.0	14.0	0.0	50
NB	103	0	57	0	1	0	0.0	11.0	0.0	25
SB	0	0	0	0	0	0	0.0	0.0	0.0	0

TRAFFIC & ROADWAY CONDITIONS

			ADJ	PARK			PEDESTRIANS			ARR
DIR	GRADE	%HV	Y/N	MOVES	BUSES	PHF	CROSS	BUT	MIN TIME	TYPE
EB	0.0%	9.0%	N	0	7	.900	100	Y	19.5	3
WB	0.0%	6.0%	N	0	7	.880	100	Y	19.5	3
NB	0.0%	2.0%	N	0	0	.710	50	Y	9.3	3
SB	0.0%	0.0%		0	0	.000	0		9.3	0

PHASINGS

	EASTBOUND				WESTBOUND				NORTHBOUND				SOUTHBOUND				GREEN	Y+R	PRE/ACT
	l	t	r	p	l	t	r	p	l	t	r	p	l	t	r	p			
1		*	*		*	*						*					54.0	4	A
2									*		*						28.0	4	A
3				*				*				*					0.0	10	A

CYCLE= 100.0

VOLUME ADJUSTMENT WORKSHEET
PART 1 (MOVEMENT ADJUSTMENTS)

DIR	LTV	THV	RTV	PHF	LTFR	THFR	RTFR
EB	0	731	49	.900	0	812	54
WB	64	845	0	.880	73	960	0
NB	103	0	57	.710	145	0	80
SB	0	0	0	.000	0	0	0

PART 2 (LANE GROUP ADJUSTMENTS)

DIR	LN GROUP	FLOW	N	LU	v	Plt	Prt
EB	TH-RT	867	2	1.05	910	0.00	0.06
WB	LT-TH	1033	2	1.05	1085	0.07	0.00
NB	LT-RT	225	1	1.00	225	0.64	0.36

PART 3 (OPPOSING VOLUME ADJUSTMENTS)

LEFT TURN	OPPOSING APPROACH									
BEING OPPOSED	VOLUMES			% OPPOSING LEFT TURN			# LANES			OPPOSING
	LT	TH	RT	LT	TH	RT	LT	TH	RT	VOLUME
WESTBOUND	0	812	54	100	100	100	0	2	0	867
NORTHBOUND	0	0	0	0	0	0	0	0	0	0

SATURATION FLOW ADJUSTMENT WORKSHEET

DIR	LN GROUP	IDEAL	N	Fwid	Fhv	Fgr	Fpark	Fbus	Farea	Frt	Flt	s
EB	TH-RT	1800	2	1.033	0.957	1.000	1.000	0.985	0.900	0.989	1.000	3123
WB	LT-TH	1800	2	1.067	0.971	1.000	1.000	0.985	0.900	1.000	0.783	2590
NB	LT-RT	1800	1	0.967	0.990	1.000	1.000	1.000	0.900	0.835	0.782	1013

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT
INPUT VARIABLES

DIR	C	G	N	Va	Vm	Vlt	Plt	No	Vo	Plto
WB	100	54	2	1033	1033	73	0.07	2	867	0.00

CALCULATIONS

DIR	Sop	Yo	Gu	Fs	Pl	Gq	Pt	Gf	El	Fm	Flt
WB	3600	0.241	39.357	0.333	0.286	14.599	0.714	4.566	3.375	0.567	0.783

CAPACITY ANALYSIS WORKSHEET

DIR	LN GROUP	v	s	v/s	g/C	c	v/c	CRITICAL
EB	TH-RT	910	3123	0.29	0.54	1685	0.54	
WB	LT-TH	1085	2590	0.42	0.54	1397	0.78	*
NB	LT-RT	225	1013	0.22	0.28	284	0.79	*

CYCLE=100.0 LOST=18.0 SUM V/S CRIT= 0.64 TOTAL V/C= 0.78

LEVEL OF SERVICE WORKSHEET

DIR	LN GROUP	v/c	g/C	C	d1	c	d2	PF	Delay	LOS	Avg Q	95% Q
EB	TH-RT	0.54	0.54	100.0	11.37	1685	0.28	0.85	9.90	B	11.1	
WB	LT-TH	0.78	0.54	100.0	13.86	1397	1.98	0.85	13.47	B	13.2	
NB	LT-RT	0.79	0.28	100.0	25.31	284	9.69	1.00	34.99	D	4.5	

DIR	Delay	LOS
EB	9.90	B
WB	13.47	B
NB	34.99	D

INTERSECTION DELAY = 14.19 INTERSECTION LOS=B

THE CYCLE LENGTH WITHIN THE BOUNDS OF 100 TO 100 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 100.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE 55.4 SECONDS
for chosen cycle length 100.0
suggested timing phase 1 is 53.6 secs green, 4.0 secs yellow + red clear
suggested timing phase 2 is 28.4 secs green, 4.0 secs yellow + red clear
suggested timing phase 3 is 0.0 secs green, 10.0 secs yellow + red clear

CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
TREMONT ST/PARKER ST
5-AM 94 EXISTING
date:02-28-1994 time:13:51:45
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=5AM94EX GEOMETRICS=5EX SIGNAL=5AM94EX
LOCATED IN CBD:Y
VOLUME & GEOMETRICS

	VOLUMES			# OF LANES			LANE WIDTH			CROSS
DIR	LT	TH	RT	LT	TH	RT	LT	TH	RT	WALK
EB	35	450	30	0	1	0	0.0	15.0	0.0	40
WB	55	617	145	0	2	0	0.0	15.0	0.0	40
NB	0	0	0	0	0	0	0.0	0.0	0.0	0
SB	71	41	21	0	1	0	0.0	10.0	0.0	30

TRAFFIC & ROADWAY CONDITIONS

			ADJ	PARK			PEDESTRIANS			ARR
DIR	GRADE	%HV	Y/N	MOVES	BUSES	PHF	CROSS	BUT	MIN TIME	TYPE
EB	0.0%	4.0%	N	0	5	.920	100	Y	17.0	3
WB	0.0%	3.0%	Y	0	5	.910	100	Y	17.0	3
NB	0.0%	0.0%		0	0	.000	0		14.5	0
SB	0.0%	4.0%	Y	0	0	.890	50	Y	14.5	3

PHASINGS

	EASTBOUND				WESTBOUND				NORTHBOUND				SOUTHBOUND				GREEN	Y+R	PRE/ACT
	l	t	r	p	l	t	r	p	l	t	r	p	l	t	r	p			
1	*	*	*		*	*	*										61.3	4	A
2													*	*	*		19.7	4	A
3				*				*				*				*	0.0	11	A

CYCLE= 100.0

VOLUME ADJUSTMENT WORKSHEET
PART 1 (MOVEMENT ADJUSTMENTS)

DIR	LTV	THV	RTV	PHF	LTFR	THFR	RTFR
EB	35	450	30	.920	38	489	33
WB	55	617	145	.910	60	678	159
NB	0	0	0	.000	145	0	80
SB	71	41	21	.890	80	46	24

PART 2 (LANE GROUP ADJUSTMENTS)

DIR	LN GROUP	FLOW	N	LU	v	Plt	Prt
EB	LT-TH-RT	560	1	1.00	560	0.07	0.06
WB	LT-TH-RT	898	2	1.05	943	0.07	0.18
SB	LT-TH-RT	149	1	1.00	149	0.53	0.16

PART 3 (OPPOSING VOLUME ADJUSTMENTS)

LEFT TURN	OPPOSING APPROACH									
BEING OPPOSED	VOLUMES			% OPPOSING LEFT TURN			# LANES			OPPOSING
	LT	TH	RT	LT	TH	RT	LT	TH	RT	VOLUME
EASTBOUND	60	678	159	100	100	100	0	2	0	898
WESTBOUND	38	489	33	100	100	100	0	1	0	522
SOUTHBOUND	145	0	80	0	0	0	0	0	0	0

SATURATION FLOW ADJUSTMENT WORKSHEET

DIR	LN GROUP	IDEAL	N	Fwid	Fhv	Fgr	Fpark	Fbus	Farea	Frt	Flt	s
EB	LT-TH-RT	1800	1	1.100	0.980	1.000	1.000	0.979	0.900	0.892	0.865	1320
WB	LT-TH-RT	1800	2	1.100	0.985	1.000	1.000	0.990	0.900	0.973	0.847	2864
SB	LT-TH-RT	1800	1	0.933	0.980	1.000	1.000	1.000	0.900	0.871	0.803	1036

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT
INPUT VARIABLES

DIR	C	G	N	Va	Vm	Vlt	Plt	No	Vo	Plto
EB	100	61	1	560	522	38	0.07	2	898	0.07

```
WB 100  61  2  898  898   60 0.07  1  522 0.07
CALCULATIONS
DIR Sop     Yo      Gu     Fs     Pl      Gq     Pt      Gf        El     Fm    Flt
EB 3362 0.267 47.141 0.314 0.068 14.114 0.932 10.737    3.584 0.865 0.865
WB 1531 0.341 41.228 0.549 0.219 20.027 0.781  6.523    2.050 0.693 0.847

CAPACITY ANALYSIS WORKSHEET
DIR LN GROUP     v     s  v/s  g/C     c  v/c  CRITICAL
EB  LT-TH-RT  560 1320 0.42 0.61  808 0.69     *
WB  LT-TH-RT  943 2864 0.33 0.61 1754 0.54
SB  LT-TH-RT  149 1036 0.14 0.20  205 0.73     *

CYCLE=100.0  LOST=19.0  SUM V/S CRIT= 0.57 TOTAL V/C= 0.70

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c  g/C    C      d1     c      d2   PF    Delay LOS Avg Q  95% Q
EB  LT-TH-RT 0.69 0.61 100.0   9.91  808    1.79 0.85    9.94  B   6.0
WB  LT-TH-RT 0.54 0.61 100.0   8.50 1754    0.26 0.85    7.45  B   9.7
SB  LT-TH-RT 0.73 0.20 100.0  28.60  205    8.36 0.85   31.42  D   3.3

DIR Delay LOS
EB   9.94  B
WB   7.45  B
SB  31.42  D
INTERSECTION DELAY = 10.46 INTERSECTION LOS=B

THE CYCLE LENGTH WITHIN THE BOUNDS OF  100  TO  100 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 100.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE  47.3 SECONDS
for chosen cycle length 100.0
suggested timing phase 1 is  60.4 secs green,   4.0 secs yellow + red clear
suggested timing phase 2 is  20.6 secs green,   4.0 secs yellow + red clear
suggested timing phase 3 is   0.0 secs green,  11.0 secs yellow + red clear
```

CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
TREMONT ST/PARKER ST
5-PM 94 EXISTING
date:02-28-1994 time:13:52:45
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=5PM94EX GEOMETRICS=5EX SIGNAL=5PM94EX
LOCATED IN CBD:Y

VOLUME & GEOMETRICS

	VOLUMES			# OF LANES			LANE WIDTH			CROSS
DIR	LT	TH	RT	LT	TH	RT	LT	TH	RT	WALK
EB	29	546	64	0	1	0	0.0	15.0	0.0	40
WB	32	461	113	0	2	0	0.0	15.0	0.0	40
NB	0	0	0	0	0	0	0.0	0.0	0.0	0
SB	95	100	24	0	1	0	0.0	10.0	0.0	30

TRAFFIC & ROADWAY CONDITIONS

			ADJ	PARK			PEDESTRIANS			ARR
DIR	GRADE	%HV	Y/N	MOVES	BUSES	PHF	CROSS	BUT	MIN TIME	TYPE
EB	0.0%	3.0%	N	0	5	.900	100	Y	17.0	3
WB	0.0%	2.0%	Y	0	5	.850	100	Y	17.0	3
NB	0.0%	0.0%		0	0	.000	0		14.5	0
SB	0.0%	1.0%	Y	0	0	.780	50	Y	14.5	3

PHASINGS

	EASTBOUND				WESTBOUND				NORTHBOUND				SOUTHBOUND				GREEN	Y+R	PRE/ACT
	l	t	r	p	l	t	r	p	l	t	r	p	l	t	r	p			
1	*	*	*		*	*	*										53.4	4	A
2													*	*	*		27.6	4	A
3				*				*				*				*	0.0	11	A

CYCLE= 100.0

VOLUME ADJUSTMENT WORKSHEET
PART 1 (MOVEMENT ADJUSTMENTS)

DIR	LTV	THV	RTV	PHF	LTFR	THFR	RTFR
EB	29	546	64	.900	32	607	71
WB	32	461	113	.850	38	542	133
NB	0	0	0	.000	145	0	80
SB	95	100	24	.780	122	128	31

PART 2 (LANE GROUP ADJUSTMENTS)

DIR	LN GROUP	FLOW	N	LU	v	Plt	Prt
EB	LT-TH-RT	710	1	1.00	710	0.05	0.10
WB	LT-TH-RT	713	2	1.05	749	0.05	0.19
SB	LT-TH-RT	281	1	1.00	281	0.43	0.11

PART 3 (OPPOSING VOLUME ADJUSTMENTS)

LEFT TURN	OPPOSING APPROACH									
BEING OPPOSED	VOLUMES			% OPPOSING LEFT TURN			# LANES			OPPOSING
	LT	TH	RT	LT	TH	RT	LT	TH	RT	VOLUME
EASTBOUND	38	542	133	100	100	100	0	2	0	713
WESTBOUND	32	607	71	100	100	100	0	1	0	678
SOUTHBOUND	145	0	80	0	0	0	0	0	0	0

SATURATION FLOW ADJUSTMENT WORKSHEET

DIR	LN GROUP	IDEAL	N	Fwid	Fhv	Fgr	Fpark	Fbus	Farea	Frt	Flt	s
EB	LT-TH-RT	1800	1	1.100	0.985	1.000	1.000	0.979	0.900	0.886	0.951	1449
WB	LT-TH-RT	1800	2	1.100	0.990	1.000	1.000	0.990	0.900	0.972	0.728	2471
SB	LT-TH-RT	1800	1	0.933	0.995	1.000	1.000	1.000	0.900	0.880	0.821	1087

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT
INPUT VARIABLES

DIR	C	G	N	Va	Vm	Vlt	Plt	No	Vo	Plto
EB	100	53	1	710	678	32	0.05	2	713	0.05

WB	100	53	2	713	713	38	0.05	1	678	0.05

CALCULATIONS

DIR	Sop	Yo	Gu	Fs	Pl	Gq	Pt	Gf	El	Fm	Flt
EB	3337	0.214	40.757	0.429	0.045	12.657	0.955	10.714	2.620	0.951	0.951
WB	1677	0.404	21.806	0.451	0.249	31.608	0.751	5.953	2.492	0.456	0.728

CAPACITY ANALYSIS WORKSHEET

DIR	LN GROUP	v	s	v/s	g/C	c	v/c	CRITICAL
EB	LT-TH-RT	710	1449	0.49	0.53	774	0.92	*
WB	LT-TH-RT	749	2471	0.30	0.53	1320	0.57	
SB	LT-TH-RT	281	1087	0.26	0.28	300	0.94	*

CYCLE=100.0 LOST=19.0 SUM V/S CRIT= 0.75 TOTAL V/C= 0.92

LEVEL OF SERVICE WORKSHEET

DIR	LN GROUP	v/c	g/C	C	d1	c	d2	PF	Delay	LOS	Avg Q	95% Q
EB	LT-TH-RT	0.92	0.53	100.0	16.18	774	11.39	0.85	23.43	C	9.2	
WB	LT-TH-RT	0.57	0.53	100.0	11.83	1320	0.44	0.85	10.43	B	9.2	
SB	LT-TH-RT	0.94	0.28	100.0	26.87	300	25.65	0.85	44.64	E	6.3	

DIR	Delay	LOS
EB	23.43	C
WB	10.43	B
SB	44.64	E

INTERSECTION DELAY = 21.26 INTERSECTION LOS=C

THE CYCLE LENGTH WITHIN THE BOUNDS OF 100 TO 100 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 100.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE 89.6 SECONDS
for chosen cycle length 100.0
suggested timing phase 1 is 53.0 secs green, 4.0 secs yellow + red clear
suggested timing phase 2 is 28.0 secs green, 4.0 secs yellow + red clear
suggested timing phase 3 is 0.0 secs green, 11.0 secs yellow + red clear

CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 10: UNSIGNALIZED - 4 APPROACHES (PAGE 1 OF 2)
DATE:03-11-1994 TIME:08:53:08
AM HEATH/PARKER #1 NB

LAST DATASETS LOADED OR SAVED
VOLUME=1AM1NB GEOMETRICS=1AM1NB

```
KEY:   D
       |
    A-   -B
       |
       C
```

GENERAL CHARACTERISTICS
POPULATION GREATER THAN 250,000: NO
CONTROLS: FROM C: YIELD
FROM D: YIELD
PREVAILING SPEED: 30 MPH
MAIN STREET # OF LANES: 2 LANES
MAIN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: NO
MAIN STREET APPROACH B - EXCLUSIVE RIGHT TURN LANE: NO

MINOR STREET LANES

APPROACH: C: PARKER NB
EXCLUSIVE LEFT TURN LANES: NO
EXCLUSIVE RIGHT TURN LANES: NO
LARGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
RIGHT TURN ACCELERATION LANE ON MAJOR: NO

APPROACH: D: PARKER SB
EXCLUSIVE LEFT TURN LANES: NO
EXCLUSIVE RIGHT TURN LANES: NO
LARGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
RIGHT TURN ACCELERATION LANE ON MAJOR: NO

SIGHT DISTANCE RESTRICTIONS (in seconds)

APPROACH	A: HEATH EB	B: HEATH WB	C: PARKER NB	D: PARKER SB
LEFTS	0.00	0.00	0.00	0.00
THRUS	0.00	0.00	0.00	0.00
RIGHTS	0.00	0.00	0.00	0.00

APPROACH	A: HEATH EB			B: HEATH WB			C: PARKER NB			D: PARKER SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
VOLUME	134	359	4	5	0	388	0	7	2	0	0	0
PHF	0.92			0.83			0.75			0.90		
ADJ VOLUME	146	390	4	6	0	467	0	9	3	0	0	0
PERCENT GRADE	0.00			0.00			0.00					
PASS CAR/HR	160			7			0	10	3	0	0	0

STEP 1 RIGHT TURNS FROM	C:PARKER NB	D:PARKER SB
CONFLICTING FLOWS	392	234
CRITICAL GAPS	5.0	5.0
CAPACITY	803	949
CAPACITY USED	0%	0%
IMPEDANCE FACTOR	1.00	1.00
ACTUAL CAPACITY	803	949

DATE:03-11-1994 TIME:08:53:08
AM HEATH/PARKER #1 NB

STEP 2 LEFT TURNS FROM	B:HEATH WB	A:HEATH EB
CONFLICTING FLOWS	395	467
CRITICAL GAPS	5.0	5.0
CAPACITY	801	740
CAPACITY USED	1%	22%
IMPEDANCE FACTOR	1.00	0.85
ACTUAL CAPACITY	801	740

STEP 3 THRU MOVES FROM	C:PARKER NB	D:PARKER SB
CONFLICTING FLOWS	1012	780
CRITICAL GAPS	5.5	5.5
CAPACITY	323	440
CAPACITY USED	3%	0%
IMPEDANCE FACTOR	0.98	1.00
ACTUAL CAPACITY	273	371

STEP 4 LEFT TURNS FROM	C:PARKER NB	D:PARKER SB
CONFLICTING FLOWS	1012	792
CRITICAL GAPS	6.0	6.0
CAPACITY	269	369
ACTUAL CAPACITY	227	306

SUMMARY OF LEVEL OF SERVICE BY MOVEMENT

MOVEMENT	DEMAND	CAPACITY	RESERVE	LOS	AVG DEL(SEC)	AVG Q
LT FROM A:	160	740	580	A	6.21	0.
LT FROM B:	7	801	795	A	4.53	0.
ALL MOVES FROM C:	13	319	306	B	11.75	0.

CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 10: UNSIGNALIZED - 4 APPROACHES (PAGE 1 OF 2)
DATE:03-11-1994 TIME:09:02:53
PM HEATH/PARKER #1 NB

LAST DATASETS LOADED OR SAVED
VOLUME=1PM1NB GEOMETRICS=1PM1NB

```
KEY:    D
        |
    A-  |  -B
        |
        C
```

GENERAL CHARACTERISTICS
POPULATION GREATER THAN 250,000: NO
CONTROLS: FROM C: YIELD
FROM D: YIELD
PREVAILING SPEED: 30 MPH
MAIN STREET # OF LANES: 2 LANES
MAIN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: NO
MAIN STREET APPROACH B - EXCLUSIVE RIGHT TURN LANE: NO

MINOR STREET LANES

APPROACH: C: PARKER NB
EXCLUSIVE LEFT TURN LANES: NO
EXCLUSIVE RIGHT TURN LANES: NO
LARGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
RIGHT TURN ACCELERATION LANE ON MAJOR: NO

APPROACH: D: PARKER SB
EXCLUSIVE LEFT TURN LANES: NO
EXCLUSIVE RIGHT TURN LANES: NO
LARGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
RIGHT TURN ACCELERATION LANE ON MAJOR: NO

SIGHT DISTANCE RESTRICTIONS (in seconds)

APPROACH	A: HEATH EB	B: HEATH WB	C: PARKER NB	D: PARKER SB
LEFTS	0.00	0.00	0.00	0.00
THRUS	0.00	0.00	0.00	0.00
RIGHTS	0.00	0.00	0.00	0.00

APPROACH	A: HEATH EB			B: HEATH WB			C: PARKER NB			D: PARKER SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
VOLUME	158	499	9	11	0	303	0	8	10	0	0	0
PHF	0.97			0.92			0.41			0.90		
ADJ VOLUME	163	514	9	12	0	329	0	20	24	0	0	0
PERCENT GRADE	0.00			0.00			0.00					
PASS CAR/HR	179			13			0	21	27	0	0	0

STEP 1 RIGHT TURNS FROM	C:PARKER NB	D:PARKER SB
CONFLICTING FLOWS	519	165
CRITICAL GAPS	5.0	5.0
CAPACITY	699	1019
CAPACITY USED	4%	0%
IMPEDANCE FACTOR	0.98	1.00
ACTUAL CAPACITY	699	1019

1985 HCM - CHAPTER 10: UNSIGNALIZED - 4 APPROACHES (PAGE 2 OF 2)
DATE:03-11-1994 TIME:09:02:53
PM HEATH/PARKER #1 NB

STEP 2 LEFT TURNS FROM	B:HEATH WB	A:HEATH EB
CONFLICTING FLOWS	524	329
CRITICAL GAPS	5.0	5.0
CAPACITY	696	859
CAPACITY USED	2%	21%
IMPEDANCE FACTOR	0.99	0.85
ACTUAL CAPACITY	696	859

STEP 3 THRU MOVES FROM	C:PARKER NB	D:PARKER SB
CONFLICTING FLOWS	1023	863
CRITICAL GAPS	5.5	5.5
CAPACITY	318	395
CAPACITY USED	7%	0%
IMPEDANCE FACTOR	0.96	1.00
ACTUAL CAPACITY	269	334

STEP 4 LEFT TURNS FROM	C:PARKER NB	D:PARKER SB
CONFLICTING FLOWS	1023	907
CRITICAL GAPS	6.0	6.0
CAPACITY	264	313
ACTUAL CAPACITY	223	250

SUMMARY OF LEVEL OF SERVICE BY MOVEMENT

MOVEMENT	DEMAND	CAPACITY	RESERVE	LOS	AVG DEL(SEC)	AVG QU
LT FROM A:	179	859	680	A	5.30	0.[illegible]
LT FROM B:	13	696	683	A	5.27	0.[illegible]
ALL MOVES FROM C:	48	409	360	B	9.99	0.[illegible]

CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 10: UNSIGNALIZED - 4 APPROACHES (PAGE 1 OF 2)
DATE:03-11-1994 TIME:09:24:17
AM HEATH/PARKER #2 NB

LAST DATASETS LOADED OR SAVED
VOLUME=1AM2NB GEOMETRICS=1AM2NB

```
KEY:   D
       |
    A-   -B
       |
       C
```

GENERAL CHARACTERISTICS
POPULATION GREATER THAN 250,000: NO
CONTROLS: FROM C: YIELD
FROM D: YIELD
PREVAILING SPEED: 30 MPH
MAIN STREET # OF LANES: 4 LANES
MAIN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: NO
MAIN STREET APPROACH B - EXCLUSIVE RIGHT TURN LANE: YES

MINOR STREET LANES

APPROACH: C: NEW HEATH WB
EXCLUSIVE LEFT TURN LANES: NO
EXCLUSIVE RIGHT TURN LANES: NO
LARGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
RIGHT TURN ACCELERATION LANE ON MAJOR: NO

APPROACH: D: HEATH ST
EXCLUSIVE LEFT TURN LANES: NO
EXCLUSIVE RIGHT TURN LANES: NO
LARGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
RIGHT TURN ACCELERATION LANE ON MAJOR: NO

SIGHT DISTANCE RESTRICTIONS (in seconds)

APPROACH	A: PARKER NB	B: PARKER SB	C: NEW HEATH W	D: HEATH ST
LEFTS	0.00	0.00	0.00	0.00
THRUS	0.00	0.00	0.00	0.00
RIGHTS	0.00	0.00	0.00	0.00

APPROACH	A: PARKER NB			B: PARKER SB			C: NEW HEATH W			D: HEATH ST		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
VOLUME	332	75	123	17	2	143	0	53	11	5	5	5
PHF	0.84			0.81			0.86			0.81		
ADJ VOLUME	395	89	146	21	2	177	0	62	13	6	6	6
PERCENT GRADE	0.00			0.00			0.00					
PASS CAR/HR	435			23			0	68	14	7	7	7

STEP 1 RIGHT TURNS FROM	C:NEW HEATH WB	D:HEATH ST
CONFLICTING FLOWS	118	1
CRITICAL GAPS	5.0	5.0
CAPACITY	1068	1199
CAPACITY USED	1%	1%
IMPEDANCE FACTOR	0.99	1.00
ACTUAL CAPACITY	1068	1199

1985 HCM - CHAPTER 10: UNSIGNALIZED - 4 APPROACHES (PAGE 2 OF 2)
DATE:03-11-1994 TIME:09:24:17
AM HEATH/PARKER #2 NB

STEP 2 LEFT TURNS FROM	B:PARKER SB	A:PARKER NB
CONFLICTING FLOWS	236	2
CRITICAL GAPS	5.5	5.5
CAPACITY	853	1105
CAPACITY USED	3%	39%
IMPEDANCE FACTOR	0.99	0.68
ACTUAL CAPACITY	853	1105

STEP 3 THRU MOVES FROM	C:NEW HEATH WB	D:HEATH ST
CONFLICTING FLOWS	581	654
CRITICAL GAPS	6.0	6.0
CAPACITY	494	447
CAPACITY USED	14%	2%
IMPEDANCE FACTOR	0.91	0.99
ACTUAL CAPACITY	333	301

STEP 4 LEFT TURNS FROM	C:NEW HEATH WB	D:HEATH ST
CONFLICTING FLOWS	594	729
CRITICAL GAPS	6.5	6.5
CAPACITY	425	348
ACTUAL CAPACITY	284	212

SUMMARY OF LEVEL OF SERVICE BY MOVEMENT

MOVEMENT	DEMAND	CAPACITY	RESERVE	LOS	AVG DEL(SEC)	AVG QU
LT FROM A:	435	1105	670	A	5.37	0.6
LT FROM B:	23	853	830	A	4.34	0.0
ALL MOVES FROM C:	82	377	295	C	12.18	0.2
ALL MOVES FROM D:	20	338	318	B	11.32	0.0

CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 10: UNSIGNALIZED - 4 APPROACHES (PAGE 1 OF 2)
DATE:03-11-1994 TIME:09:17:41
PM HEATH/PARKER #2 NB

LAST DATASETS LOADED OR SAVED
VOLUME=1PM2NB GEOMETRICS=1PM2NB

```
KEY:    D
        |
    A-     -B
        |
        C
```

GENERAL CHARACTERISTICS
POPULATION GREATER THAN 250,000: NO
CONTROLS: FROM C: YIELD
FROM D: YIELD
PREVAILING SPEED: 30 MPH
MAIN STREET # OF LANES: 4 LANES
MAIN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: NO
MAIN STREET APPROACH B - EXCLUSIVE RIGHT TURN LANE: YES

MINOR STREET LANES

APPROACH: C: NEW HEATH WB
EXCLUSIVE LEFT TURN LANES: NO
EXCLUSIVE RIGHT TURN LANES: NO
LARGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
RIGHT TURN ACCELERATION LANE ON MAJOR: NO

APPROACH: D: HEATH ST
EXCLUSIVE LEFT TURN LANES: NO
EXCLUSIVE RIGHT TURN LANES: NO
LARGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
RIGHT TURN ACCELERATION LANE ON MAJOR: NO

SIGHT DISTANCE RESTRICTIONS (in seconds)

APPROACH	A: PARKER NB	B: PARKER SB	C: NEW HEATH W	D: HEATH ST
LEFTS	0.00	0.00	0.00	0.00
THRUS	0.00	0.00	0.00	0.00
RIGHTS	0.00	0.00	0.00	0.00

APPROACH	A: PARKER NB			B: PARKER SB			C: NEW HEATH W			D: HEATH ST		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
VOLUME	296	60	113	14	2	319	0	70	6	5	5	5
PHF	0.92			0.89			0.63			0.81		
ADJ VOLUME	322	65	123	16	2	358	0	111	10	6	6	6
PERCENT GRADE	0.00			0.00			0.00					
PASS CAR/HR	354			17			0	122	10	7	7	7

STEP 1 RIGHT TURNS FROM	C:NEW HEATH WB	D:HEATH ST
CONFLICTING FLOWS	94	1
CRITICAL GAPS	5.0	5.0
CAPACITY	1094	1199
CAPACITY USED	1%	1%
IMPEDANCE FACTOR	1.00	1.00
ACTUAL CAPACITY	1094	1199

1985 HCM - CHAPTER 10: UNSIGNALIZED - 4 APPROACHES (PAGE 2 OF 2)
DATE:03-11-1994 TIME:09:17:41
PM HEATH/PARKER #2 NB

STEP 2 LEFT TURNS FROM	B:PARKER SB	A:PARKER NB
CONFLICTING FLOWS	188	2
CRITICAL GAPS	5.5	5.5
CAPACITY	900	1105
CAPACITY USED	2%	32%
IMPEDANCE FACTOR	0.99	0.75
ACTUAL CAPACITY	900	1105

STEP 3 THRU MOVES FROM	C:NEW HEATH WB	D:HEATH ST
CONFLICTING FLOWS	466	528
CRITICAL GAPS	6.0	6.0
CAPACITY	575	530
CAPACITY USED	21%	1%
IMPEDANCE FACTOR	0.85	0.99
ACTUAL CAPACITY	429	396

STEP 4 LEFT TURNS FROM	C:NEW HEATH WB	D:HEATH ST
CONFLICTING FLOWS	479	648
CRITICAL GAPS	6.5	6.5
CAPACITY	502	392
ACTUAL CAPACITY	372	247

SUMMARY OF LEVEL OF SERVICE BY MOVEMENT

MOVEMENT	DEMAND	CAPACITY	RESERVE	LOS	AVG DEL(SEC)	AVG Q
LT FROM A:	354	1105	751	A	4.79	0.
LT FROM B:	17	900	883	A	4.08	0.
ALL MOVES FROM C:	133	451	318	B	11.32	0.
ALL MOVES FROM D:	20	405	385	B	9.35	0.

```
CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 1 of 2)
DATE:03-11-1994                TIME:09:40:47
AM HEATH/PARKER #3 NB


LAST DATASETS LOADED OR SAVED
VOLUME=1AM3NB      GEOMETRICS=1AM3NB
KEY: A- -B
       |
       C
GENERAL CHARACTERISTICS
POPULATION GREATER THAN 250,000: NO
CONTROLS: FROM C: YIELD
PREVAILING SPEED:  30  MPH
MAIN STREET # OF LANES: 2 LANES
MAIN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: N

MINOR STREET LANES
APPROACH: C: HEATH WB
SHARED LEFT AND RIGHT TURN LANE: YES
LARGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
RIGHT TURN ACCELERATION LANE ON MAJOR: NO


SIGHT DISTANCE RESTRICTIONS (in seconds)
APPROACH        A:             B: HEATH EB    C: HEATH WB
LEFTS             0.00           0.00           0.00
THRUS             0.00           0.00           0.00
RIGHTS            0.00           0.00           0.00


APPROACH        A:             B: HEATH EB    C: HEATH WB
                 LT   TH   RT   LT   TH   RT   LT   TH   RT
VOLUME            0    1    1    0  497    0   71    0  457
PHF               0.90           0.92           0.81
ADJ VOLUME        0    1    1    0  540    0   88    0  564
PERCENT GRADE     0.00           0.00           0.00
PASS CAR/HR       0              0             96    0  621


STEP 1 RIGHT TURNS FROM     C:HEATH WB
CONFLICTING FLOWS                       2
CRITICAL GAPS                         5.0
CAPACITY                             1198
ACTUAL CAPACITY                      1198


STEP 2 LEFT TURNS FROM     B:HEATH EB
CONFLICTING FLOWS                       2
CRITICAL GAPS                         5.0
CAPACITY                             1197
CAPACITY USED                          0%
IMPEDANCE FACTOR                     1.00
ACTUAL CAPACITY                      1197
```

1985 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 2 of 2)
DATE:03-11-1994 TIME:09:40:47
AM HEATH/PARKER #3 NB

STEP 3 LEFT TURNS FROM	C:HEATH WB
CONFLICTING FLOWS	542
CRITICAL GAPS	6.0
CAPACITY	521
ACTUAL CAPACITY	521

SUMMARY OF LEVEL OF SERVICE BY MOVEMENT

MOVEMENT	DEMAND	CAPACITY	RESERVE	LOS	AVG DEL(SEC)	AVG Q
ALL MOVES FROM C:	717	1020	303	B	11.90	2.

CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 1 of 2)
DATE:03-11-1994 TIME:09:50:36
PM HEATH/PARKER #3 NB

LAST DATASETS LOADED OR SAVED
VOLUME=1PM3NB GEOMETRICS=1PM3NB

```
KEY: A- -B
       |
       C
```

GENERAL CHARACTERISTICS
POPULATION GREATER THAN 250,000: NO
CONTROLS: FROM C: YIELD
PREVAILING SPEED: 30 MPH
MAIN STREET # OF LANES: 2 LANES
MAIN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: N

MINOR STREET LANES
APPROACH: C: HEATH WB
SHARED LEFT AND RIGHT TURN LANE: YES
LARGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
RIGHT TURN ACCELERATION LANE ON MAJOR: NO

SIGHT DISTANCE RESTRICTIONS (in seconds)

APPROACH	A:	B: HEATH EB	C: HEATH WB
LEFTS	0.00	0.00	0.00
THRUS	0.00	0.00	0.00
RIGHTS	0.00	0.00	0.00

APPROACH	A:			B: HEATH EB			C: HEATH WB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT
VOLUME	0	1	1	0	667	0	201	0	484
PHF	0.90			0.97			0.80		
ADJ VOLUME	0	1	1	0	688	0	251	0	605
PERCENT GRADE	0.00			0.00			0.00		
PASS CAR/HR	0			0			276	0	666

STEP 1 RIGHT TURNS FROM	C:HEATH WB
CONFLICTING FLOWS	2
CRITICAL GAPS	5.0
CAPACITY	1198
ACTUAL CAPACITY	1198

STEP 2 LEFT TURNS FROM	B:HEATH EB
CONFLICTING FLOWS	2
CRITICAL GAPS	5.0
CAPACITY	1197
CAPACITY USED	0%
IMPEDANCE FACTOR	1.00
ACTUAL CAPACITY	1197

DATE:03-11-1994 TIME:09:50:36
PM HEATH/PARKER #3 NB

STEP 3 LEFT TURNS FROM	C:HEATH WB
CONFLICTING FLOWS	689
CRITICAL GAPS	6.0
CAPACITY	426
ACTUAL CAPACITY	426

SUMMARY OF LEVEL OF SERVICE BY MOVEMENT

MOVEMENT	DEMAND	CAPACITY	RESERVE	LOS	AVG DEL(SEC)	AVG QU
ALL MOVES FROM C:	942	782	-160	F	INFINITE	INFINI

CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 1 of 2)
DATE:03-08-1994 TIME:12:59:19
S.HUNTINGTON AVE/HEATH ST-AM NB

LAST DATASETS LOADED OR SAVED
VOLUME=2AM98NB GEOMETRICS=2AM98NB

```
KEY: A- -B
       |
       C
```

GENERAL CHARACTERISTICS
POPULATION GREATER THAN 250,000: YES
CONTROLS: FROM C: YIELD
PREVAILING SPEED: 35 MPH
MAIN STREET # OF LANES: 4 LANES
MAIN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: Y

MINOR STREET LANES
APPROACH: C: HEATH ST. WB
SHARED LEFT AND RIGHT TURN LANE: YES
LARGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: YES
RIGHT TURN ACCELERATION LANE ON MAJOR: YES

SIGHT DISTANCE RESTRICTIONS (in seconds)

APPROACH	A: S.HUNT-NB	B: S.HUNT-SB	C: HEATH ST. W
LEFTS	0.00	0.00	0.00
THRUS	0.00	0.00	0.00
RIGHTS	0.00	0.00	0.00

APPROACH	A: S.HUNT-NB			B: S.HUNT-SB			C: HEATH ST. W		
	LT	TH	RT	LT	TH	RT	LT	TH	RT
VOLUME	0	444	221	230	316	0	109	0	205
PHF	0.90			0.97			0.86		
ADJ VOLUME	0	493	246	237	326	0	127	0	238
PERCENT GRADE	0.00			0.00			0.00		
PERCENT CYCLES	0.00			0.00			0.00		
PASSENGER CARS	94.00			99.00			98.00		
PERCENT LT TRU	0.00			0.00			0.00		
PERCENT HV TRU	6.00			1.00			2.00		
PASS CAR/HR	0			239			129	0	243

STEP 1 RIGHT TURNS FROM	C:HEATH ST. WB
CONFLICTING FLOWS	247
CRITICAL GAPS	4.1
CAPACITY	1155
ACTUAL CAPACITY	1155

STEP 2 LEFT TURNS FROM	B:S.HUNT-SB
CONFLICTING FLOWS	493
CRITICAL GAPS	5.1
CAPACITY	700
CAPACITY USED	34%
IMPEDANCE FACTOR	0.73
ACTUAL CAPACITY	700

DATE:03-08-1994 TIME:12:59:19
S.HUNTINGTON AVE/HEATH ST-AM NB

STEP 3 LEFT TURNS FROM	C:HEATH ST. WB
CONFLICTING FLOWS	1179
CRITICAL GAPS	6.2
CAPACITY	192
ACTUAL CAPACITY	141

SUMMARY OF LEVEL OF SERVICE BY MOVEMENT

MOVEMENT	DEMAND	CAPACITY	RESERVE	LOS	AVG DEL(SEC)	AVG QU
LT FROM B:	239	700	461	A	7.81	0.
ALL MOVES FROM C:	372	330	-42	F	INFINITE	INFINI

CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 1 of 2)
DATE:03-08-1994 TIME:12:55:52
S.HUNTINGTON AVE/HEATH ST-PM NB

LAST DATASETS LOADED OR SAVED
VOLUME=2PM98NB GEOMETRICS=2PM98NB

```
KEY: A- -B
       |
       C
```

GENERAL CHARACTERISTICS
POPULATION GREATER THAN 250,000: YES
CONTROLS: FROM C: YIELD
PREVAILING SPEED: 35 MPH
MAIN STREET # OF LANES: 4 LANES
MAIN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: Y

MINOR STREET LANES
APPROACH: C: HEATH WB
SHARED LEFT AND RIGHT TURN LANE: YES
LARGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: YES
RIGHT TURN ACCELERATION LANE ON MAJOR: YES

SIGHT DISTANCE RESTRICTIONS (in seconds)

APPROACH	A: S.HUNT- NB	B: S.HUNT-SB	C: HEATH WB
LEFTS	0.00	0.00	0.00
THRUS	0.00	0.00	0.00
RIGHTS	0.00	0.00	0.00

APPROACH	A: S.HUNT- NB			B: S.HUNT-SB			C: HEATH WB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT
VOLUME	0	417	84	182	426	0	197	0	176
PHF	0.88			0.90			0.92		
ADJ VOLUME	0	474	95	202	473	0	214	0	191
PERCENT GRADE	0.00			0.00			0.00		
PERCENT CYCLES	0.00			0.00			0.00		
PASSENGER CARS	98.00			99.00			99.00		
PERCENT LT TRU	0.00			0.00			0.00		
PERCENT HV TRU	2.00			1.00			1.00		
PASS CAR/HR	0			204			216	0	193

STEP 1 RIGHT TURNS FROM	C:HEATH WB
CONFLICTING FLOWS	237
CRITICAL GAPS	4.1
CAPACITY	1164
ACTUAL CAPACITY	1164

STEP 2 LEFT TURNS FROM	B:S.HUNT-SB
CONFLICTING FLOWS	474
CRITICAL GAPS	5.1
CAPACITY	716
CAPACITY USED	29%
IMPEDANCE FACTOR	0.78
ACTUAL CAPACITY	716

S.HUNTINGTON AVE/HEATH ST-PM NB

STEP 3 LEFT TURNS FROM	C:HEATH WB
CONFLICTING FLOWS	1197
CRITICAL GAPS	6.2
CAPACITY	187
ACTUAL CAPACITY	147

SUMMARY OF LEVEL OF SERVICE BY MOVEMENT

MOVEMENT	DEMAND	CAPACITY	RESERVE	LOS	AVG DEL(SEC)	AVG QU
LT FROM B:	204	716	512	A	7.04	0.
ALL MOVES FROM C:	409	250	-160	F	INFINITE	INFINI

CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
S.HUNTINGTON AVE/ HUNTINGTON AVE
3-AM 98 NO BUILD
date:03-08-1994 time:10:49:13
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=3AM98NB GEOMETRICS=3EX SIGNAL=3AM98NB
LOCATED IN CBD:Y

VOLUME & GEOMETRICS

	VOLUMES			# OF LANES			LANE WIDTH			CROSS
DIR	LT	TH	RT	LT	TH	RT	LT	TH	RT	WALK
EB	0	1170	332	0	2	0	0.0	12.0	0.0	50
WB	155	499	0	1	1	0	12.0	12.0	0.0	60
NB	325	0	230	1	0	1	12.0	0.0	12.0	50
SB	0	0	0	0	0	0	0.0	0.0	0.0	0

TRAFFIC & ROADWAY CONDITIONS

			ADJ	PARK			PEDESTRIANS			ARR
DIR	GRADE	%HV	Y/N	MOVES	BUSES	PHF	CROSS	BUT	MIN TIME	TYPE
EB	0.0%	5.0%	N	0	0	.940	100	Y	22.0	3
WB	0.0%	7.0%	N	0	0	.910	100	Y	22.0	3
NB	0.0%	4.0%	N	0	10	.880	100	Y	19.5	3
SB	0.0%	0.0%		0	0	.000	0		19.5	0

PHASINGS

	EASTBOUND				WESTBOUND				NORTHBOUND				SOUTHBOUND				GREEN	Y+R	PRE/ACT
	l	t	r	p	l	t	r	p	l	t	r	p	l	t	r	p			
1					*	*					*						10.2	4	A
2		*	*			*											49.0	4	A
3				*				*				*				*	0.0	7	A
4			*			*			*		*						21.8	4	A

CYCLE= 100.0

VOLUME ADJUSTMENT WORKSHEET
PART 1 (MOVEMENT ADJUSTMENTS)

DIR	LTV	THV	RTV	PHF	LTFR	THFR	RTFR
EB	0	1170	332	.940	0	1245	353
WB	155	499	0	.910	170	548	0
NB	325	0	230	.880	369	0	261
SB	0	0	0	.000	0	0	0

PART 2 (LANE GROUP ADJUSTMENTS)

DIR	LN GROUP	FLOW	N	LU	v	Plt	Prt
EB	TH-RT	1598	2	1.05	1678	0.00	0.22
WB	LT	170	1	1.00	170	1.00	0.00
WB	TH	548	1	1.00	548	0.00	0.00
NB	LT	369	1	1.00	369	1.00	0.00
NB	RT	261	1	1.00	261	0.00	1.00

PART 3 (OPPOSING VOLUME ADJUSTMENTS)

LEFT TURN	OPPOSING APPROACH									
BEING OPPOSED	VOLUMES			% OPPOSING LEFT TURN			# LANES			OPPOSING
	LT	TH	RT	LT	TH	RT	LT	TH	RT	VOLUME
WESTBOUND	0	1245	353	0	0	0	0	2	0	0
NORTHBOUND	0	0	0	0	0	0	0	0	0	0

SATURATION FLOW ADJUSTMENT WORKSHEET

DIR	LN GROUP	IDEAL	N	Fwid	Fhv	Fgr	Fpark	Fbus	Farea	Frt	Flt	s
EB	TH-RT	1800	2	1.000	0.976	1.000	1.000	1.000	0.900	0.967	1.000	3056
WB	LT	1800	1	1.000	0.966	1.000	1.000	1.000	0.900	1.000	0.950	1487
WB	TH	1800	1	1.000	0.966	1.000	1.000	1.000	0.900	1.000	1.000	1565
NB	LT	1800	1	1.000	0.980	1.000	1.000	1.000	0.900	1.000	0.950	1509
NB	RT	1800	1	1.000	0.980	1.000	1.000	0.958	0.900	0.850	1.000	1294

CAPACITY ANALYSIS WORKSHEET

DIR	LN GROUP	v	s	v/s	g/C	c	v/c	CRITICAL
EB	TH-RT	1678	3056	0.55	0.49	1496	1.12	*
WB	LT	170	1487	0.11	0.10	152	1.12	*
WB	TH	548	1565	0.35	0.89	1393	0.39	
NB	LT	369	1509	0.24	0.22	329	1.12	*
NB	RT	261	1294	0.20	0.36	466	0.56	

CYCLE=100.0 LOST=19.0 SUM V/S CRIT= 0.91 TOTAL V/C= 1.12

LEVEL OF SERVICE WORKSHEET

DIR	LN GROUP	v/c	g/C	C	d1	c	d2	PF	Delay	LOS	Avg Q	95% Q
EB	TH-RT	1.12	0.49	100.0	21.95	1496	61.96	0.85	71.32	F	43.0	
WB	LT	1.12	0.10	100.0	34.60	152	105.69	1.00	140.28	F	8.8	
WB	TH	0.39	0.89	100.0	0.71	1393	0.10	0.85	0.69	A	1.7	
NB	LT	1.12	0.22	100.0	30.75	329	83.63	1.00	114.37	F	15.7	
NB	RT	0.56	0.36	100.0	19.48	466	1.16	0.85	17.54	C	4.6	

DIR	Delay	LOS
EB	71.32	F
WB	33.77	D
NB	74.25	F

INTERSECTION DELAY = 63.02 INTERSECTION S=F

THE CYCLE LENGTH WITHIN THE BOUNDS OF 100 TO 100 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 100.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE 432.8 SECONDS
THE EXISTING TIMING IS OPTIMAL

CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
S.HUNTINGTON AVE/ HUNTINGTON AVE
3-PM 98 NO BUILD
date:03-08-1994 time:10:43:34
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=3PM98NB GEOMETRICS=3EX SIGNAL=3PM98NB
LOCATED IN CBD:Y
VOLUME & GEOMETRICS

	VOLUMES			# OF LANES			LANE WIDTH			CROSS
DIR	LT	TH	RT	LT	TH	RT	LT	TH	RT	WALK
EB	0	663	336	0	2	0	0.0	12.0	0.0	50
WB	253	1008	0	1	1	0	12.0	12.0	0.0	60
NB	325	0	172	1	0	1	12.0	0.0	12.0	50
SB	0	0	0	0	0	0	0.0	0.0	0.0	0

TRAFFIC & ROADWAY CONDITIONS

			ADJ	PARK			PEDESTRIANS			ARR
DIR	GRADE	%HV	Y/N	MOVES	BUSES	PHF	CROSS	BUT	MIN TIME	TYPE
EB	0.0%	7.0%	N	0	0	.940	100	Y	22.0	3
WB	0.0%	5.0%	N	0	0	.930	100	Y	22.0	3
NB	0.0%	4.0%	N	0	10	.830	100	Y	19.5	3
SB	0.0%	0.0%		0	0	.000	0		19.5	0

PHASINGS

	EASTBOUND				WESTBOUND				NORTHBOUND				SOUTHBOUND				GREEN	Y+R	PRE/ACT
	l	t	r	p	l	t	r	p	l	t	r	p	l	t	r	p			
1					*	*					*						18.0	4	A
2		*	*			*											37.3	4	A
3				*				*				*				*	0.0	7	A
4			*			*			*		*						25.8	4	A

CYCLE= 100.0

VOLUME ADJUSTMENT WORKSHEET
PART 1 (MOVEMENT ADJUSTMENTS)

DIR	LTV	THV	RTV	PHF	LTFR	THFR	RTFR
EB	0	663	336	.940	0	705	357
WB	253	1008	0	.930	272	1084	0
NB	325	0	172	.830	392	0	207
SB	0	0	0	.000	0	0	0

PART 2 (LANE GROUP ADJUSTMENTS)

DIR	LN GROUP	FLOW	N	LU	v	Plt	Prt
EB	TH-RT	1063	2	1.05	1116	0.00	0.34
WB	LT	272	1	1.00	272	1.00	0.00
WB	TH	1084	1	1.00	1084	0.00	0.00
NB	LT	392	1	1.00	392	1.00	0.00
NB	RT	207	1	1.00	207	0.00	1.00

PART 3 (OPPOSING VOLUME ADJUSTMENTS)

LEFT TURN	OPPOSING APPROACH									
BEING OPPOSED	VOLUMES			% OPPOSING LEFT TURN			# LANES			OPPOSING
	LT	TH	RT	LT	TH	RT	LT	TH	RT	VOLUME
WESTBOUND	0	705	357	0	0	0	0	2	0	0
NORTHBOUND	0	0	0	0	0	0	0	0	0	0

SATURATION FLOW ADJUSTMENT WORKSHEET

DIR	LN GROUP	IDEAL	N	Fwid	Fhv	Fgr	Fpark	Fbus	Farea	Frt	Flt	s
EB	TH-RT	1800	2	1.000	0.966	1.000	1.000	1.000	0.900	0.950	1.000	2973
WB	LT	1800	1	1.000	0.976	1.000	1.000	1.000	0.900	1.000	0.950	1501
WB	TH	1800	1	1.000	0.976	1.000	1.000	1.000	0.900	1.000	1.000	1580
NB	LT	1800	1	1.000	0.980	1.000	1.000	1.000	0.900	1.000	0.950	1509
NB	RT	1800	1	1.000	0.980	1.000	1.000	0.958	0.900	0.850	1.000	1294

CAPACITY ANALYSIS WORKSHEET

DIR	LN GROUP	v	s	v/s	g/C	c	v/c	CRITICAL
EB	TH-RT	1116	2973	0.38	0.37	1108	1.01	*
WB	LT	272	1501	0.18	0.18	270	1.01	*
WB	TH	1084	1580	0.69	0.89	1407	0.77	
NB	LT	392	1509	0.26	0.26	389	1.01	*
NB	RT	207	1294	0.16	0.48	618	0.34	

CYCLE=100.0 LOST=19.0 SUM V/S CRIT= 0.82 TOTAL V/C= 1.01

LEVEL OF SERVICE WORKSHEET

DIR	LN GROUP	v/c	g/C	C	d1	c	d2	PF	Delay	LOS	Avg Q	95% Q
EB	TH-RT	1.01	0.37	100.0	23.95	1108	22.55	0.85	39.53	D	20.9	
WB	LT	1.01	0.18	100.0	31.22	270	44.26	1.00	75.48	F	8.8	
WB	TH	0.77	0.89	100.0	1.46	1407	1.89	0.85	2.85	A	3.3	
NB	LT	1.01	0.26	100.0	28.29	389	37.12	1.00	65.40	F	11.2	
NB	RT	0.34	0.48	100.0	12.36	618	0.13	0.85	10.61	B	3.0	

DIR	Delay	LOS
EB	39.53	D
WB	17.42	C
NB	46.44	E

INTERSECTION DELAY = 31.11 INTERSECTION LOS=D

THE CYCLE LENGTH WITHIN THE BOUNDS OF 100 TO 100 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 100.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE 134.8 SECONDS
THE EXISTING TIMING IS OPTIMAL

CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
HUNTINGTON AVE/PARKER HILL AVE
4-AM 98 NO BUILD
date:03-08-1994 time:11:02:48
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=4AM98NB GEOMETRICS=4EX SIGNAL=4AM98NB
LOCATED IN CBD:Y
VOLUME & GEOMETRICS

DIR	VOLUMES LT	TH	RT	# OF LANES LT	TH	RT	LANE WIDTH LT	TH	RT	CROSS WALK
EB	0	993	56	0	2	0	0.0	13.0	0.0	50
WB	62	467	0	0	2	0	0.0	14.0	0.0	50
NB	43	0	49	0	1	0	0.0	11.0	0.0	25
SB	0	0	0	0	0	0	0.0	0.0	0.0	0

TRAFFIC & ROADWAY CONDITIONS

DIR	GRADE	%HV	ADJ PARK Y/N	PARK MOVES	BUSES	PHF	PEDESTRIANS CROSS	BUT	MIN TIME	ARR TYPE
EB	0.0%	7.0%	N	0	7	.910	100	Y	19.5	3
WB	0.0%	14.0%	N	0	7	.910	100	Y	19.5	3
NB	0.0%	11.0%	N	0	0	.810	50	Y	9.3	3
SB	0.0%	0.0%		0	0	.000	0		9.3	0

PHASINGS

	EASTBOUND l	t	r	p	WESTBOUND l	t	r	p	NORTHBOUND l	t	r	p	SOUTHBOUND l	t	r	p	GREEN	Y+R	PRE/ACT
1		*	*		*	*						*					60.0	4	A
2									*		*						22.0	4	A
3				*				*				*					0.0	10	A

CYCLE= 100.0

VOLUME ADJUSTMENT WORKSHEET
PART 1 (MOVEMENT ADJUSTMENTS)

DIR	LTV	THV	RTV	PHF	LTFR	THFR	RTFR
EB	0	993	56	.910	0	1091	62
WB	62	467	0	.910	68	513	0
NB	43	0	49	.810	53	0	60
SB	0	0	0	.000	0	0	0

PART 2 (LANE GROUP ADJUSTMENTS)

DIR	LN GROUP	FLOW	N	LU	v	Plt	Prt
EB	TH-RT	1153	2	1.05	1210	0.00	0.05
WB	LT-TH	581	2	1.05	610	0.12	0.00
NB	LT-RT	114	1	1.00	114	0.47	0.53

PART 3 (OPPOSING VOLUME ADJUSTMENTS)

LEFT TURN BEING OPPOSED	OPPOSING APPROACH VOLUMES LT	TH	RT	% OPPOSING LEFT TURN LT	TH	RT	# LANES LT	TH	RT	OPPOSING VOLUME
WESTBOUND	0	1091	62	100	100	100	0	2	0	1153
NORTHBOUND	0	0	0	0	0	0	0	0	0	0

SATURATION FLOW ADJUSTMENT WORKSHEET

DIR	LN GROUP	IDEAL	N	Fwid	Fhv	Fgr	Fpark	Fbus	Farea	Frt	Flt	s
EB	TH-RT	1800	2	1.033	0.966	1.000	1.000	0.985	0.900	0.991	1.000	3158
WB	LT-TH	1800	2	1.067	0.935	1.000	1.000	0.985	0.900	1.000	0.594	1889
NB	LT-RT	1800	1	0.967	0.948	1.000	1.000	1.000	0.900	0.803	0.815	971

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT
INPUT VARIABLES

DIR	C	G	N	Va	Vm	Vlt	Plt	No	Vo	Plto
WB	100	60	2	581	581	68	0.12	2	1153	0.00

CALCULATIONS

```
DIR Sop     Yo      Gu      Fs      Pl      Gq      Pt      Gf        El      Fm     Flt
WB 3600 0.320 41.159 0.155 0.765 18.841 0.235  0.615    7.280 0.187 0.594

CAPACITY ANALYSIS WORKSHEET
DIR LN GROUP     v     s  v/s  g/C     c  v/c  CRITICAL
EB  TH-RT     1210 3158 0.38 0.60 1895 0.64      *
WB  LT-TH      610 1889 0.32 0.60 1134 0.54
NB  LT-RT      114  971 0.12 0.22  214 0.53      *

CYCLE=100.0  LOST=18.0  SUM V/S CRIT= 0.50 TOTAL V/C= 0.61

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c  g/C   C      d1    c       d2   PF   Delay LOS Avg Q  95% Q
EB  TH-RT     0.64 0.60 100.0   9.86 1895     0.52 0.85    8.82  B  12.8
WB  LT-TH     0.54 0.60 100.0   8.98 1134     0.41 0.85    7.98  B   6.5
NB  LT-RT     0.53 0.22 100.0  26.18  214     2.00 1.00   28.18  D   2.5

DIR Delay LOS
EB   8.82  B
WB   7.98  B
NB  28.18  D
INTERSECTION DELAY =  9.69 INTERSECTION LOS=B

THE CYCLE LENGTH WITHIN THE BOUNDS OF  100  TO  100 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 100.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE  38.0 SECONDS
for chosen cycle length 100.0
suggested timing phase 1 is  62.8 secs green,   4.0 secs yellow + red clear
suggested timing phase 2 is  19.2 secs green,   4.0 secs yellow + red clear
suggested timing phase 3 is   0.0 secs green,  10.0 secs yellow + red clear
```

```
CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
HUNTINGTON AVE/PARKER HILL AVE
4-PM 98 NO BUILD
date:03-08-1994                time:11:14:36
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=4PM98NB    GEOMETRICS=4EX        SIGNAL=4PM98NB
LOCATED IN CBD:Y
VOLUME & GEOMETRICS
        VOLUMES        # OF LANES     LANE WIDTH      CROSS
DIR  LT   TH    RT    LT TH RT       LT    TH    RT     WALK
EB    0  769    51     0  2  0      0.0 13.0  0.0     50
WB   67  974     0     0  2  0      0.0 14.0  0.0     50
NB  107    0    59     0  1  0      0.0 11.0  0.0     25
SB    0    0     0     0  0  0      0.0  0.0  0.0      0

TRAFFIC & ROADWAY CONDITIONS
                 ADJ PARK             PEDESTRIANS        ARR
DIR GRADE %HV   Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
EB  0.0%  9.0%   N     0     7  .900  100  Y     19.5    3
WB  0.0%  6.0%   N     0     7  .880  100  Y     19.5    3
NB  0.0%  2.0%   N     0     0  .710   50  Y      9.3    3
SB  0.0%  0.0%         0     0  .000    0         9.3    0

PHASINGS
    EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
    l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
 1     *  *     *  *                 *              55.6   4    A
 2                          *     *                 26.4   4    A
 3             *           *           *             0.0  10    A

CYCLE= 100.0

VOLUME ADJUSTMENT WORKSHEET
PART 1 (MOVEMENT ADJUSTMENTS)
DIR  LTV  THV  RTV   PHF  LTFR THFR RTFR
EB     0  769   51  .900     0  854   57
WB    67  974    0  .880    76 1107    0
NB   107    0   59  .710   151    0   83
SB     0    0    0  .000     0    0    0

PART 2 (LANE GROUP ADJUSTMENTS)
DIR LN GROUP   FLOW N   LU    v  Plt  Prt
EB  TH-RT       911 2 1.05  957 0.00 0.06
WB  LT-TH      1183 2 1.05 1242 0.06 0.00
NB  LT-RT       234 1 1.00  234 0.64 0.36

PART 3 (OPPOSING VOLUME ADJUSTMENTS)
LEFT TURN                OPPOSING APPROACH
BEING OPPOSED       VOLUMES       % OPPOSING LEFT TURN     # LANES      OPPOSING
                 LT   TH    RT        LT    TH    RT        LT  TH  RT     VOLUME
WESTBOUND         0  854    57       100   100   100         0   2   0      911
NORTHBOUND        0    0     0         0     0     0         0   0   0        0

SATURATION FLOW ADJUSTMENT WORKSHEET
DIR LN GROUP  IDEAL N  Fwid   Fhv   Fgr Fpark  Fbus Farea   Frt   Flt    s
EB  TH-RT      1800  2 1.033 0.957 1.000 1.000 0.985 0.900 0.989 1.000 3123
WB  LT-TH      1800  2 1.067 0.971 1.000 1.000 0.985 0.900 1.000 0.776 2564
NB  LT-RT      1800  1 0.967 0.990 1.000 1.000 1.000 0.900 0.835 0.782 1013

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT
INPUT VARIABLES
DIR  C   G  N   Va   Vm  Vlt  Plt No   Vo Plto
WB 100  56  2 1183 1183   76 0.06  2  911 0.00
CALCULATIONS
```

DIR	Sop	Yo	Gu	Fs	Pl	Gq	Pt	Gf	El	Fm	Flt
WB	3600	0.253	40.597	0.306	0.276	15.034	0.724	4.780	3.682	0.551	0.776

CAPACITY ANALYSIS WORKSHEET

DIR	LN GROUP	v	s	v/s	g/C	c	v/c	CRITICAL
EB	TH-RT	957	3123	0.31	0.56	1737	0.55	
WB	LT-TH	1242	2564	0.48	0.56	1427	0.87	*
NB	LT-RT	234	1013	0.23	0.26	267	0.88	*

CYCLE=100.0 LOST=18.0 SUM V/S CRIT= 0.72 TOTAL V/C= 0.87

LEVEL OF SERVICE WORKSHEET

DIR	LN GROUP	v/c	g/C	C	d1	c	d2	PF	Delay	LOS	Avg Q	95% Q
EB	TH-RT	0.55	0.56	100.0	10.78	1737	0.29	0.85	9.42	B	11.2	
WB	LT-TH	0.87	0.56	100.0	14.51	1427	4.39	0.85	16.06	C	14.6	
NB	LT-RT	0.88	0.26	100.0	26.78	267	18.04	1.00	44.82	E	5.3	

DIR	Delay	LOS
EB	9.42	B
WB	16.06	C
NB	44.82	E

INTERSECTION DELAY = 16.21 INTERSECTION LOS=C

THE CYCLE LENGTH WITHIN THE BOUNDS OF 100 TO 100 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 100.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE 72.8 SECONDS
for chosen cycle length 100.0
suggested timing phase 1 is 55.5 secs green, 4.0 secs yellow + red clear
suggested timing phase 2 is 26.5 secs green, 4.0 secs yellow + red clear
suggested timing phase 3 is 0.0 secs green, 10.0 secs yellow + red clear

CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
TREMONT ST/PARKER ST
5-AM 98 NO BUILD
date:03-08-1994 time:17:22:02
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=5AM98NB GEOMETRICS=5EX SIGNAL=5AM98NB
LOCATED IN CBD:Y

VOLUME & GEOMETRICS

	VOLUMES			# OF LANES			LANE WIDTH			CROSS
DIR	LT	TH	RT	LT	TH	RT	LT	TH	RT	WALK
EB	36	468	31	0	1	0	0.0	15.0	0.0	40
WB	57	642	151	0	2	0	0.0	15.0	0.0	40
NB	0	0	0	0	0	0	0.0	0.0	0.0	0
SB	74	43	22	0	1	0	0.0	10.0	0.0	30

TRAFFIC & ROADWAY CONDITIONS

			ADJ	PARK			PEDESTRIANS			ARR
DIR	GRADE	%HV	Y/N	MOVES	BUSES	PHF	CROSS	BUT	MIN TIME	TYPE
EB	0.0%	4.0%	N	0	5	.920	100	Y	17.0	3
WB	0.0%	3.0%	Y	0	5	.910	100	Y	17.0	3
NB	0.0%	0.0%		0	0	.000	0		14.5	0
SB	0.0%	4.0%	Y	0	0	.890	50	Y	14.5	3

PHASINGS

	EASTBOUND				WESTBOUND				NORTHBOUND				SOUTHBOUND				GREEN	Y+R	PRE/ACT
	l	t	r	p	l	t	r	p	l	t	r	p	l	t	r	p			
1	*	*	*		*	*	*										61.3	4	A
2													*	*	*		19.7	4	A
3				*				*				*				*	0.0	11	A

CYCLE= 100.0

VOLUME ADJUSTMENT WORKSHEET
PART 1 (MOVEMENT ADJUSTMENTS)

DIR	LTV	THV	RTV	PHF	LTFR	THFR	RTFR
EB	36	468	31	.920	39	509	34
WB	57	642	151	.910	63	705	166
NB	0	0	0	.000	0	0	0
SB	74	43	22	.890	83	48	25

PART 2 (LANE GROUP ADJUSTMENTS)

DIR	LN GROUP	FLOW	N	LU	v	Plt	Prt
EB	LT-TH-RT	582	1	1.00	582	0.07	0.06
WB	LT-TH-RT	934	2	1.05	981	0.07	0.18
SB	LT-TH-RT	156	1	1.00	156	0.53	0.16

PART 3 (OPPOSING VOLUME ADJUSTMENTS)

LEFT TURN	OPPOSING APPROACH									
BEING OPPOSED	VOLUMES			% OPPOSING LEFT TURN			# LANES			OPPOSING
	LT	TH	RT	LT	TH	RT	LT	TH	RT	VOLUME
EASTBOUND	63	705	166	100	100	100	0	2	0	934
WESTBOUND	39	509	34	100	100	100	0	1	0	542
SOUTHBOUND	0	0	0	0	0	0	0	0	0	0

SATURATION FLOW ADJUSTMENT WORKSHEET

DIR	LN GROUP	IDEAL	N	Fwid	Fhv	Fgr	Fpark	Fbus	Farea	Frt	Flt	s
EB	LT-TH-RT	1800	1	1.100	0.980	1.000	1.000	0.979	0.900	0.892	0.852	1301
WB	LT-TH-RT	1800	2	1.100	0.985	1.000	1.000	0.990	0.900	0.973	0.830	2809
SB	LT-TH-RT	1800	1	0.933	0.980	1.000	1.000	1.000	0.900	0.871	0.803	1037

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT
INPUT VARIABLES

DIR	C	G	N	Va	Vm	Vlt	Plt	No	Vo	Plto
EB	100	61	1	582	542	39	0.07	2	934	0.07
WB	100	61	2	934	934	63	0.07	1	542	0.07

CALCULATIONS

DIR	Sop	Yo	Gu	Fs	Pl	Gq	Pt	Gf	El	Fm	Flt
EB	3353	0.279	46.294	0.291	0.067	14.962	0.933	11.259	3.863	0.852	0.852
WB	1509	0.359	39.519	0.536	0.227	21.736	0.773	6.396	2.099	0.661	0.830

CAPACITY ANALYSIS WORKSHEET

DIR	LN GROUP	v	s	v/s	g/C	c	v/c	CRITICAL
EB	LT-TH-RT	582	1301	0.45	0.61	797	0.73	*
WB	LT-TH-RT	981	2809	0.35	0.61	1720	0.57	
SB	LT-TH-RT	156	1037	0.15	0.20	205	0.76	*

CYCLE=100.0 LOST=19.0 SUM V/S CRIT= 0.60 TOTAL V/C= 0.74

LEVEL OF SERVICE WORKSHEET

DIR	LN GROUP	v/c	g/C	C	d1	c	d2	PF	Delay	LOS	Avg Q	95% Q
EB	LT-TH-RT	0.73	0.61	100.0	10.32	797	2.38	0.85	10.80	B	6.3	
WB	LT-TH-RT	0.57	0.61	100.0	8.77	1720	0.34	0.85	7.74	B	10.1	
SB	LT-TH-RT	0.76	0.20	100.0	28.82	205	10.41	0.85	33.34	D	3.5	

DIR	Delay	LOS
EB	10.80	B
WB	7.74	B
SB	33.34	D

INTERSECTION DELAY = 11.10 INTERSECTION LOS=B

THE CYCLE LENGTH WITHIN THE BOUNDS OF 100 TO 100 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 100.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE 51.2 SECONDS
for chosen cycle length 100.0
suggested timing phase 1 is 60.6 secs green,   4.0 secs yellow + red clear
suggested timing phase 2 is 20.4 secs green,   4.0 secs yellow + red clear
suggested timing phase 3 is   0.0 secs green, 11.0 secs yellow + red clear

CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
TREMONT ST/PARKER ST
5-PM 98 NO BUILD
date:03-08-1994 time:17:25:16
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=5PM98NB GEOMETRICS=5EX SIGNAL=5PM98NB
LOCATED IN CBD:Y

VOLUME & GEOMETRICS

	VOLUMES			# OF LANES			LANE WIDTH			CROSS
DIR	LT	TH	RT	LT	TH	RT	LT	TH	RT	WALK
EB	30	568	67	0	1	0	0.0	15.0	0.0	40
WB	33	480	118	0	2	0	0.0	15.0	0.0	40
NB	0	0	0	0	0	0	0.0	0.0	0.0	0
SB	99	104	25	0	1	0	0.0	10.0	0.0	30

TRAFFIC & ROADWAY CONDITIONS

			ADJ PARK				PEDESTRIANS			ARR
DIR	GRADE	%HV	Y/N	MOVES	BUSES	PHF	CROSS	BUT	MIN TIME	TYPE
EB	0.0%	3.0%	N	0	5	.900	100	Y	17.0	3
WB	0.0%	2.0%	Y	0	5	.850	100	Y	17.0	3
NB	0.0%	0.0%		0	0	.000	0		14.5	0
SB	0.0%	1.0%	Y	0	0	.780	50	Y	14.5	3

PHASINGS

	EASTBOUND				WESTBOUND				NORTHBOUND				SOUTHBOUND				GREEN	Y+R	PRE/ACT
	l	t	r	p	l	t	r	p	l	t	r	p	l	t	r	p			
1	*	*	*		*	*	*										53.4	4	A
2													*	*	*		27.6	4	A
3				*				*				*				*	0.0	11	A

CYCLE= 100.0

VOLUME ADJUSTMENT WORKSHEET
PART 1 (MOVEMENT ADJUSTMENTS)

DIR	LTV	THV	RTV	PHF	LTFR	THFR	RTFR
EB	30	568	67	.900	33	631	74
WB	33	480	118	.850	39	565	139
NB	0	0	0	.000	0	0	0
SB	99	104	25	.780	127	133	32

PART 2 (LANE GROUP ADJUSTMENTS)

DIR	LN GROUP	FLOW	N	LU	v	Plt	Prt
EB	LT-TH-RT	739	1	1.00	739	0.05	0.10
WB	LT-TH-RT	742	2	1.05	779	0.05	0.19
SB	LT-TH-RT	292	1	1.00	292	0.43	0.11

PART 3 (OPPOSING VOLUME ADJUSTMENTS)

LEFT TURN	OPPOSING APPROACH									
BEING OPPOSED	VOLUMES			% OPPOSING LEFT TURN			# LANES			OPPOSING
	LT	TH	RT	LT	TH	RT	LT	TH	RT	VOLUME
EASTBOUND	39	565	139	100	100	100	0	2	0	742
WESTBOUND	33	631	74	100	100	100	0	1	0	706
SOUTHBOUND	0	0	0	0	0	0	0	0	0	0

SATURATION FLOW ADJUSTMENT WORKSHEET

DIR	LN GROUP	IDEAL	N	Fwid	Fhv	Fgr	Fpark	Fbus	Farea	Frt	Flt	s
EB	LT-TH-RT	1800	1	1.100	0.985	1.000	1.000	0.979	0.900	0.886	0.945	1439
WB	LT-TH-RT	1800	2	1.100	0.990	1.000	1.000	0.990	0.900	0.972	0.701	2379
SB	LT-TH-RT	1800	1	0.933	0.995	1.000	1.000	1.000	0.900	0.880	0.821	1087

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT
INPUT VARIABLES

DIR	C	G	N	Va	Vm	Vlt	Plt	No	Vo	Plto
EB	100	53	1	739	706	33	0.05	2	742	0.05

WB	100	53	2	742	742	39	0.05	1	706	0.05

CALCULATIONS

DIR	Sop	Yo	Gu	Fs	Pl	Gq	Pt	Gf	El	Fm	Flt
EB	3323	0.223	40.014	0.411	0.045	13.399	0.955	11.262	2.737	0.945	0.945
WB	1669	0.423	19.305	0.434	0.269	34.109	0.731	5.404	2.592	0.402	0.701

CAPACITY ANALYSIS WORKSHEET

DIR	LN GROUP	v	s	v/s	g/C	c	v/c	CRITICAL
EB	LT-TH-RT	739	1439	0.51	0.53	769	0.96	*
WB	LT-TH-RT	779	2379	0.33	0.53	1271	0.61	
SB	LT-TH-RT	292	1087	0.27	0.28	300	0.98	*

CYCLE=100.0   LOST=19.0   SUM V/S CRIT= 0.78 TOTAL V/C= 0.97

LEVEL OF SERVICE WORKSHEET

DIR	LN GROUP	v/c	g/C	C	d1	c	d2	PF	Delay	LOS	Avg Q	95% Q
EB	LT-TH-RT	0.96	0.53	100.0	16.94	769	17.20	0.85	29.03	D	10.7	
WB	LT-TH-RT	0.61	0.53	100.0	12.27	1271	0.64	0.85	10.97	B	9.6	
SB	LT-TH-RT	0.98	0.28	100.0	27.26	300	33.68	0.85	51.80	E	7.1	

DIR	Delay	LOS
EB	29.03	D
WB	10.97	B
SB	51.80	E

INTERSECTION DELAY = 24.93 INTERSECTION LOS=C

THE CYCLE LENGTH WITHIN THE BOUNDS OF 100 TO 100 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 100.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE 107.7 SECONDS
for chosen cycle length 100.0
suggested timing phase 1 is 53.1 secs green, 4.0 secs yellow + red clear
suggested timing phase 2 is 27.9 secs green, 4.0 secs yellow + red clear
suggested timing phase 3 is 0.0 secs green, 11.0 secs yellow + red clear

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CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 10: UNSIGNALIZED - 4 APPROACHES (PAGE 1 OF 2)
DATE:03-28-1994                 TIME:13:50:25
AM HEATH/PARKER #1 B


LAST DATASETS LOADED OR SAVED
VOLUME=1AM1B      GEOMETRICS=1AM1B
KEY:    D
        |
     A- | -B
        |
        C
GENERAL CHARACTERISTICS
POPULATION GREATER THAN 250,000: NO
CONTROLS: FROM C: YIELD
          FROM D: YIELD
PREVAILING SPEED:  30  MPH
MAIN STREET # OF LANES: 2 LANES
MAIN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: NO
MAIN STREET APPROACH B - EXCLUSIVE RIGHT TURN LANE: NO

MINOR STREET LANES

APPROACH: C: PARKER NB
EXCLUSIVE LEFT TURN LANES: NO
EXCLUSIVE RIGHT TURN LANES: NO
LARGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
RIGHT TURN ACCELERATION LANE ON MAJOR: NO

APPROACH: D: PARKER SB
EXCLUSIVE LEFT TURN LANES: NO
EXCLUSIVE RIGHT TURN LANES: NO
LARGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
RIGHT TURN ACCELERATION LANE ON MAJOR: NO

SIGHT DISTANCE RESTRICTIONS (in seconds)
APPROACH        A: HEATH EB    B: HEATH WB    C: PARKER NB   D: PARKER SB
LEFTS             0.00           0.00           0.00           0.00
THRUS             0.00           0.00           0.00           0.00
RIGHTS            0.00           0.00           0.00           0.00


APPROACH        A: HEATH EB    B: HEATH WB    C: PARKER NB   D: PARKER SB
                 LT   TH   RT   LT   TH   RT   LT   TH   RT   LT   TH   RT
VOLUME          134  359    4    5    0  390    0    7    2    0    0    0
PHF               0.92           0.83           0.75           0.90
ADJ VOLUME      146  390    4    6    0  470    0    9    3    0    0    0
PERCENT GRADE     0.00           0.00           0.00
PASS CAR/HR     160              7              0   10    3    0    0    0


STEP 1 RIGHT TURNS FROM      C:PARKER NB              D:PARKER SB
CONFLICTING FLOWS                       392                      235
CRITICAL GAPS                           5.0                      5.0
CAPACITY                                803                      948
CAPACITY USED                             0%                       0%
IMPEDANCE FACTOR                       1.00                     1.00
ACTUAL CAPACITY                         803                      948
```

1985 HCM - CHAPTER 10: UNSIGNALIZED - 4 APPROACHES (PAGE 2 OF 2)
DATE:03-28-1994 TIME:13:50:25
AM HEATH/PARKER #1 B

STEP 2 LEFT TURNS FROM	B:HEATH WB	A:HEATH EB
CONFLICTING FLOWS	395	470
CRITICAL GAPS	5.0	5.0
CAPACITY	801	738
CAPACITY USED	1%	22%
IMPEDANCE FACTOR	1.00	0.84
ACTUAL CAPACITY	801	738

STEP 3 THRU MOVES FROM	C:PARKER NB	D:PARKER SB
CONFLICTING FLOWS	1014	781
CRITICAL GAPS	5.5	5.5
CAPACITY	322	439
CAPACITY USED	3%	0%
IMPEDANCE FACTOR	0.98	1.00
ACTUAL CAPACITY	272	370

STEP 4 LEFT TURNS FROM	C:PARKER NB	D:PARKER SB
CONFLICTING FLOWS	1014	793
CRITICAL GAPS	6.0	6.0
CAPACITY	268	369
ACTUAL CAPACITY	226	305

SUMMARY OF LEVEL OF SERVICE BY MOVEMENT

MOVEMENT	DEMAND	CAPACITY	RESERVE	LOS	AVG DEL(SEC)	AVG QUE
LT FROM A:	160	738	578	A	6.23	0.8
LT FROM B:	7	801	795	A	4.53	0.1
ALL MOVES FROM C:	13	318	305	B	11.80	0.4

CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 10: UNSIGNALIZED - 4 APPROACHES (PAGE 1 OF 2)
DATE:03-28-1994 TIME:13:56:08
PM HEATH/PARKER #1 B

LAST DATASETS LOADED OR SAVED
VOLUME=1PM1B GEOMETRICS=1PM1B

```
KEY:    D
        |
     A-   -B
        |
        C
```

GENERAL CHARACTERISTICS
POPULATION GREATER THAN 250,000: NO
CONTROLS: FROM C: YIELD
FROM D: YIELD
PREVAILING SPEED: 30 MPH
MAIN STREET # OF LANES: 2 LANES
MAIN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: NO
MAIN STREET APPROACH B - EXCLUSIVE RIGHT TURN LANE: NO

MINOR STREET LANES

APPROACH: C: PARKER NB
EXCLUSIVE LEFT TURN LANES: NO
EXCLUSIVE RIGHT TURN LANES: NO
LARGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
RIGHT TURN ACCELERATION LANE ON MAJOR: NO

APPROACH: D: PARKER SB
EXCLUSIVE LEFT TURN LANES: NO
EXCLUSIVE RIGHT TURN LANES: NO
LARGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
RIGHT TURN ACCELERATION LANE ON MAJOR: NO

SIGHT DISTANCE RESTRICTIONS (in seconds)

APPROACH	A: HEATH EB	B: HEATH WB	C: PARKER NB	D: PARKER SB
LEFTS	0.00	0.00	0.00	0.00
THRUS	0.00	0.00	0.00	0.00
RIGHTS	0.00	0.00	0.00	0.00

APPROACH	A: HEATH EB			B: HEATH WB			C: PARKER NB			D: PARKER SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
VOLUME	158	501	9	11	0	303	0	8	10	0	0	0
PHF	0.97			0.92			0.41			0.90		
ADJ VOLUME	163	516	9	12	0	329	0	20	24	0	0	0
PERCENT GRADE	0.00			0.00			0.00					
PASS CAR/HR	179			13			0	21	27	0	0	0

STEP 1 RIGHT TURNS FROM	C:PARKER NB	D:PARKER SB
CONFLICTING FLOWS	521	165
CRITICAL GAPS	5.0	5.0
CAPACITY	698	1019
CAPACITY USED	4%	0%
IMPEDANCE FACTOR	0.98	1.00
ACTUAL CAPACITY	698	1019

1985 HCM - CHAPTER 10: UNSIGNALIZED - 4 APPROACHES (PAGE 2 OF 2)
DATE:03-28-1994 TIME:13:56:08
PM HEATH/PARKER #1 B

STEP 2 LEFT TURNS FROM	B:HEATH WB	A:HEATH EB
CONFLICTING FLOWS	526	329
CRITICAL GAPS	5.0	5.0
CAPACITY	694	859
CAPACITY USED	2%	21%
IMPEDANCE FACTOR	0.99	0.85
ACTUAL CAPACITY	694	859

STEP 3 THRU MOVES FROM	C:PARKER NB	D:PARKER SB
CONFLICTING FLOWS	1025	865
CRITICAL GAPS	5.5	5.5
CAPACITY	317	394
CAPACITY USED	7%	0%
IMPEDANCE FACTOR	0.96	1.00
ACTUAL CAPACITY	268	333

STEP 4 LEFT TURNS FROM	C:PARKER NB	D:PARKER SB
CONFLICTING FLOWS	1025	909
CRITICAL GAPS	6.0	6.0
CAPACITY	263	312
ACTUAL CAPACITY	223	249

SUMMARY OF LEVEL OF SERVICE BY MOVEMENT

MOVEMENT	DEMAND	CAPACITY	RESERVE	LOS	AVG DEL(SEC)	AVG [illegible]
LT FROM A:	179	859	680	A	5.30	0.2[illegible]
LT FROM B:	13	694	681	A	5.29	0.0[illegible]
ALL MOVES FROM C:	48	408	359	B	10.02	0.1[illegible]

CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 10: UNSIGNALIZED - 4 APPROACHES (PAGE 1 OF 2)
DATE:03-28-1994 TIME:13:59:12
AM HEATH/PARKER #2 B

LAST DATASETS LOADED OR SAVED
VOLUME=1AM2B GEOMETRICS=1AM2B

```
KEY:    D
        |
     A- -B
        |
        C
```

GENERAL CHARACTERISTICS
POPULATION GREATER THAN 250,000: NO
CONTROLS: FROM C: YIELD
FROM D: YIELD
PREVAILING SPEED: 30 MPH
MAIN STREET # OF LANES: 4 LANES
MAIN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: NO
MAIN STREET APPROACH B - EXCLUSIVE RIGHT TURN LANE: YES

MINOR STREET LANES

APPROACH: C: NEW HEATH WB
EXCLUSIVE LEFT TURN LANES: NO
EXCLUSIVE RIGHT TURN LANES: NO
LARGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
RIGHT TURN ACCELERATION LANE ON MAJOR: NO

APPROACH: D: HEATH ST
EXCLUSIVE LEFT TURN LANES: NO
EXCLUSIVE RIGHT TURN LANES: NO
LARGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
RIGHT TURN ACCELERATION LANE ON MAJOR: NO

SIGHT DISTANCE RESTRICTIONS (in seconds)

APPROACH	A: PARKER NB	B: PARKER SB	C: NEW HEATH W	D: HEATH ST
LEFTS	0.00	0.00	0.00	0.00
THRUS	0.00	0.00	0.00	0.00
RIGHTS	0.00	0.00	0.00	0.00

APPROACH	A: PARKER NB			B: PARKER SB			C: NEW HEATH W			D: HEATH ST		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
VOLUME	332	77	123	17	2	143	0	53	11	5	5	5
PHF	0.84			0.81			0.86			0.81		
ADJ VOLUME	395	92	146	21	2	177	0	62	13	6	6	6
PERCENT GRADE	0.00			0.00			0.00					
PASS CAR/HR	435			23			0	68	14	7	7	7

STEP 1 RIGHT TURNS FROM	C:NEW HEATH WB	D:HEATH ST
CONFLICTING FLOWS	119	1
CRITICAL GAPS	5.0	5.0
CAPACITY	1067	1199
CAPACITY USED	1%	1%
IMPEDANCE FACTOR	0.99	1.00
ACTUAL CAPACITY	1067	1199

1985 HCM - CHAPTER 10: UNSIGNALIZED - 4 APPROACHES (PAGE 2 OF 2)
DATE:03-28-1994 TIME:13:59:12
AM HEATH/PARKER #2 B

STEP 2 LEFT TURNS FROM	B:PARKER SB	A:PARKER NB
CONFLICTING FLOWS	238	2
CRITICAL GAPS	5.5	5.5
CAPACITY	851	1105
CAPACITY USED	3%	39%
IMPEDANCE FACTOR	0.99	0.68
ACTUAL CAPACITY	851	1105

STEP 3 THRU MOVES FROM	C:NEW HEATH WB	D:HEATH ST
CONFLICTING FLOWS	584	657
CRITICAL GAPS	6.0	6.0
CAPACITY	492	446
CAPACITY USED	14%	2%
IMPEDANCE FACTOR	0.91	0.99
ACTUAL CAPACITY	332	300

STEP 4 LEFT TURNS FROM	C:NEW HEATH WB	D:HEATH ST
CONFLICTING FLOWS	596	731
CRITICAL GAPS	6.5	6.5
CAPACITY	424	347
ACTUAL CAPACITY	283	211

SUMMARY OF LEVEL OF SERVICE BY MOVEMENT

MOVEMENT	DEMAND	CAPACITY	RESERVE	LOS	AVG DEL(SEC)	AVG Q
LT FROM A:	435	1105	670	A	5.37	0.5
LT FROM B:	23	851	828	A	4.35	0.3
ALL MOVES FROM C:	82	376	294	C	12.23	0.3
ALL MOVES FROM D:	20	337	317	B	11.36	0.6

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CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 10: UNSIGNALIZED - 4 APPROACHES (PAGE 1 OF 2)
DATE:03-28-1994              TIME:14:01:45
PM HEATH/PARKER #2 B


LAST DATASETS LOADED OR SAVED
VOLUME=1PM2B      GEOMETRICS=1PM2B
KEY:    D
        |
     A-   -B
        |
        C
GENERAL CHARACTERISTICS
POPULATION GREATER THAN 250,000: NO
CONTROLS: FROM C: YIELD
          FROM D: YIELD
PREVAILING SPEED:  30  MPH
MAIN STREET # OF LANES: 4 LANES
MAIN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: NO
MAIN STREET APPROACH B - EXCLUSIVE RIGHT TURN LANE: YES

MINOR STREET LANES

APPROACH: C: NEW HEATH WB
EXCLUSIVE LEFT TURN LANES: NO
EXCLUSIVE RIGHT TURN LANES: NO
LARGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
RIGHT TURN ACCELERATION LANE ON MAJOR: NO

APPROACH: D: HEATH ST
EXCLUSIVE LEFT TURN LANES: NO
EXCLUSIVE RIGHT TURN LANES: NO
LARGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
RIGHT TURN ACCELERATION LANE ON MAJOR: NO

SIGHT DISTANCE RESTRICTIONS (in seconds)
APPROACH         A: PARKER NB   B: PARKER SB   C: NEW HEATH W D: HEATH ST
LEFTS              0.00           0.00           0.00           0.00
THRUS              0.00           0.00           0.00           0.00
RIGHTS             0.00           0.00           0.00           0.00


APPROACH         A: PARKER NB   B: PARKER SB   C: NEW HEATH W D: HEATH ST
                   LT    TH   RT   LT    TH   RT   LT    TH   RT   LT    TH   RT
VOLUME           296    60  113   14     2  321    0    70    6    5     5    5
PHF                0.92            0.89            0.63            0.81
ADJ VOLUME       322    65  123   16     2  361    0   111   10    6     6    6
PERCENT GRADE      0.00            0.00            0.00
PASS CAR/HR      354               17              0   122   10    7     7    7


STEP 1 RIGHT TURNS FROM     C:NEW HEATH WB           D:HEATH ST
CONFLICTING FLOWS                       94                    1
CRITICAL GAPS                          5.0                  5.0
CAPACITY                              1094                 1199
CAPACITY USED                            1%                   1%
IMPEDANCE FACTOR                      1.00                 1.00
ACTUAL CAPACITY                       1094                 1199
```

1985 HCM - CHAPTER 10: UNSIGNALIZED - 4 APPROACHES (PAGE 2 OF 2)
DATE:03-28-1994 TIME:14:01:45
PM HEATH/PARKER #2 B

STEP 2 LEFT TURNS FROM	B:PARKER SB	A:PARKER NB
CONFLICTING FLOWS	188	2
CRITICAL GAPS	5.5	5.5
CAPACITY	900	1105
CAPACITY USED	2%	32%
IMPEDANCE FACTOR	0.99	0.75
ACTUAL CAPACITY	900	1105

STEP 3 THRU MOVES FROM	C:NEW HEATH WB	D:HEATH ST
CONFLICTING FLOWS	466	528
CRITICAL GAPS	6.0	6.0
CAPACITY	575	530
CAPACITY USED	21%	1%
IMPEDANCE FACTOR	0.85	0.99
ACTUAL CAPACITY	429	396

STEP 4 LEFT TURNS FROM	C:NEW HEATH WB	D:HEATH ST
CONFLICTING FLOWS	479	648
CRITICAL GAPS	6.5	6.5
CAPACITY	502	392
ACTUAL CAPACITY	372	247

SUMMARY OF LEVEL OF SERVICE BY MOVEMENT

MOVEMENT	DEMAND	CAPACITY	RESERVE	LOS	AVG DEL(SEC)	AVG Q
LT FROM A:	354	1105	751	A	4.79	0.
LT FROM B:	17	900	883	A	4.08	0.
ALL MOVES FROM C:	133	451	318	B	11.32	0.
ALL MOVES FROM D:	20	405	385	B	9.35	0.

CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 1 of 2)
DATE:03-11-1994 TIME:09:56:18
AM HEATH/PARKER #3 B

LAST DATASETS LOADED OR SAVED
VOLUME=1AM3B GEOMETRICS=1AM3B

```
KEY: A- -B
       |
       C
```

GENERAL CHARACTERISTICS
POPULATION GREATER THAN 250,000: NO
CONTROLS: FROM C: YIELD
PREVAILING SPEED: 30 MPH
MAIN STREET # OF LANES: 2 LANES
MAIN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: N

MINOR STREET LANES
APPROACH: C: HEATH WB
SHARED LEFT AND RIGHT TURN LANE: YES
LARGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
RIGHT TURN ACCELERATION LANE ON MAJOR: NO

SIGHT DISTANCE RESTRICTIONS (in seconds)

APPROACH	A:	B: HEATH EB	C: HEATH WB
LEFTS	0.00	0.00	0.00
THRUS	0.00	0.00	0.00
RIGHTS	0.00	0.00	0.00

APPROACH	A:			B: HEATH EB			C: HEATH WB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT
VOLUME	0	1	1	0	497	0	71	0	457
PHF	0.90			0.92			0.81		
ADJ VOLUME	0	1	1	0	540	0	88	0	564
PERCENT GRADE	0.00			0.00			0.00		
PASS CAR/HR	0			0			96	0	621

STEP 1 RIGHT TURNS FROM	C:HEATH WB
CONFLICTING FLOWS	2
CRITICAL GAPS	5.0
CAPACITY	1198
ACTUAL CAPACITY	1198

STEP 2 LEFT TURNS FROM	B:HEATH EB
CONFLICTING FLOWS	2
CRITICAL GAPS	5.0
CAPACITY	1197
CAPACITY USED	0%
IMPEDANCE FACTOR	1.00
ACTUAL CAPACITY	1197

DATE:03-11-1994 TIME:09:56:18
AM HEATH/PARKER #3 B

STEP 3 LEFT TURNS FROM	C:HEATH WB	
CONFLICTING FLOWS		542
CRITICAL GAPS		6.0
CAPACITY		521
ACTUAL CAPACITY		521

SUMMARY OF LEVEL OF SERVICE BY MOVEMENT

MOVEMENT	DEMAND	CAPACITY	RESERVE	LOS	AVG DEL(SEC)	AVG Q
ALL MOVES FROM C:	717	1020	303	B	11.90	2.

CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 1 of 2)
DATE:03-28-1994 TIME:14:11:12
PM HEATH/PARKER #3 B

LAST DATASETS LOADED OR SAVED
VOLUME=1PM3B GEOMETRICS=1PM3B

```
KEY: A- -B
       |
       C
```

GENERAL CHARACTERISTICS
POPULATION GREATER THAN 250,000: NO
CONTROLS: FROM C: YIELD
PREVAILING SPEED: 30 MPH
MAIN STREET # OF LANES: 2 LANES
MAIN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: N

MINOR STREET LANES
APPROACH: C: HEATH WB
SHARED LEFT AND RIGHT TURN LANE: YES
LARGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: NO
RIGHT TURN ACCELERATION LANE ON MAJOR: NO

SIGHT DISTANCE RESTRICTIONS (in seconds)

APPROACH	A:	B: HEATH EB	C: HEATH WB
LEFTS	0.00	0.00	0.00
THRUS	0.00	0.00	0.00
RIGHTS	0.00	0.00	0.00

APPROACH	A:			B:. HEATH EB			C: HEATH WB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT
VOLUME	0	1	1	0	668	0	203	0	484
PHF	0.90			0.97			0.80		
ADJ VOLUME	0	1	1	0	689	0	254	0	605
PERCENT GRADE	0.00			0.00			0.00		
PASS CAR/HR	0			0			279	0	666

STEP 1 RIGHT TURNS FROM	C:HEATH WB
CONFLICTING FLOWS	2
CRITICAL GAPS	5.0
CAPACITY	1198
ACTUAL CAPACITY	1198

STEP 2 LEFT TURNS FROM	B:HEATH EB
CONFLICTING FLOWS	2
CRITICAL GAPS	5.0
CAPACITY	1197
CAPACITY USED	0%
IMPEDANCE FACTOR	1.00
ACTUAL CAPACITY	1197

PM HEATH/PARKER #3 B

STEP 3 LEFT TURNS FROM	C:HEATH WB	
CONFLICTING FLOWS		690
CRITICAL GAPS		6.0
CAPACITY		426
ACTUAL CAPACITY		426

SUMMARY OF LEVEL OF SERVICE BY MOVEMENT

MOVEMENT	DEMAND	CAPACITY	RESERVE	LOS	AVG DEL(SEC)	AVG QE
ALL MOVES FROM C:	945	780	-165	F	INFINITE	INFINIE

CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 1 of 2)
DATE:03-28-1994 TIME:14:18:04
S.HUNTINGTON AVE/HEATH ST-AM BUILD

LAST DATASETS LOADED OR SAVED
VOLUME=2AM98B GEOMETRICS=2AM98B

```
KEY: A- -B
       |
       C
```

GENERAL CHARACTERISTICS
POPULATION GREATER THAN 250,000: YES
CONTROLS: FROM C: YIELD
PREVAILING SPEED: 35 MPH
MAIN STREET # OF LANES: 4 LANES
MAIN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: Y

MINOR STREET LANES
APPROACH: C: HEATH ST. WB
SHARED LEFT AND RIGHT TURN LANE: YES
LARGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: YES
RIGHT TURN ACCELERATION LANE ON MAJOR: YES

SIGHT DISTANCE RESTRICTIONS (in seconds)

APPROACH	A: S.HUNT-NB	B: S.HUNT-SB	C: HEATH ST. W
LEFTS	0.00	0.00	0.00
THRUS	0.00	0.00	0.00
RIGHTS	0.00	0.00	0.00

APPROACH	A: S.HUNT-NB			B: S.HUNT-SB			C: HEATH ST. W		
	LT	TH	RT	LT	TH	RT	LT	TH	RT
VOLUME	0	444	228	232	316	0	110	0	205
PHF	0.90			0.97			0.86		
ADJ VOLUME	0	493	253	239	326	0	128	0	238
PERCENT GRADE	0.00			0.00			0.00		
PERCENT CYCLES	0.00			0.00			0.00		
PASSENGER CARS	94.00			99.00			98.00		
PERCENT LT TRU	0.00			0.00			0.00		
PERCENT HV TRU	6.00			1.00			2.00		
PASS CAR/HR	0			242			130	0	243

STEP 1 RIGHT TURNS FROM	C:HEATH ST. WB
CONFLICTING FLOWS	247
CRITICAL GAPS	4.1
CAPACITY	1155
ACTUAL CAPACITY	1155

STEP 2 LEFT TURNS FROM	B:S.HUNT-SB
CONFLICTING FLOWS	493
CRITICAL GAPS	5.1
CAPACITY	700
CAPACITY USED	34%
IMPEDANCE FACTOR	0.73
ACTUAL CAPACITY	700

1985 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 2 of 2)
DATE:03-28-1994 TIME:14:18:04
S.HUNTINGTON AVE/HEATH ST-AM BUILD

STEP 3 LEFT TURNS FROM	C:HEATH ST. WB
CONFLICTING FLOWS	1185
CRITICAL GAPS	6.2
CAPACITY	191
ACTUAL CAPACITY	139

SUMMARY OF LEVEL OF SERVICE BY MOVEMENT

MOVEMENT	DEMAND	CAPACITY	RESERVE	LOS	AVG DEL(SEC)	AVG
LT FROM B:	242	700	459	A	7.85	0
ALL MOVES FROM C:	374	325	-49	F	INFINITE	INFIN

CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 10 : UNSIGNALIZED - 3 APPROACHES (PAGE 1 of 2)
DATE:03-28-1994 TIME:14:20:57
S.HUNTINGTON AVE/HEATH ST-PM BUILD

LAST DATASETS LOADED OR SAVED
VOLUME=2PM98B GEOMETRICS=2PM98B

```
KEY: A- -B
       |
       C
```

GENERAL CHARACTERISTICS
POPULATION GREATER THAN 250,000: YES
CONTROLS: FROM C: YIELD
PREVAILING SPEED: 35 MPH
MAIN STREET # OF LANES: 4 LANES
MAIN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: Y

MINOR STREET LANES
APPROACH: C: HEATH WB
SHARED LEFT AND RIGHT TURN LANE: YES
LARGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: YES
RIGHT TURN ACCELERATION LANE ON MAJOR: YES

SIGHT DISTANCE RESTRICTIONS (in seconds)

APPROACH	A: S.HUNT- NB	B: S.HUNT-SB	C: HEATH WB
LEFTS	0.00	0.00	0.00
THRUS	0.00	0.00	0.00
RIGHTS	0.00	0.00	0.00

APPROACH	A: S.HUNT- NB			B: S.HUNT-SB			C: HEATH WB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT
VOLUME	0	417	84	182	426	0	202	0	177
PHF	0.88			0.90			0.92		
ADJ VOLUME	0	474	95	202	473	0	220	0	192
PERCENT GRADE	0.00			0.00			0.00		
PERCENT CYCLES	0.00			0.00			0.00		
PASSENGER CARS	98.00			99.00			99.00		
PERCENT LT TRU	0.00			0.00			0.00		
PERCENT HV TRU	2.00			1.00			1.00		
PASS CAR/HR	0			204			222	0	194

STEP 1 RIGHT TURNS FROM	C:HEATH WB
CONFLICTING FLOWS	237
CRITICAL GAPS	4.1
CAPACITY	1164
ACTUAL CAPACITY	1164

STEP 2 LEFT TURNS FROM	B:S.HUNT-SB
CONFLICTING FLOWS	474
CRITICAL GAPS	5.1
CAPACITY	716
CAPACITY USED	29%
IMPEDANCE FACTOR	0.78
ACTUAL CAPACITY	716

DATE:03-28-1994 TIME:14:20:57
S.HUNTINGTON AVE/HEATH ST-PM BUILD

STEP 3 LEFT TURNS FROM	C:HEATH WB
CONFLICTING FLOWS	1197
CRITICAL GAPS	6.2
CAPACITY	187
ACTUAL CAPACITY	147

SUMMARY OF LEVEL OF SERVICE BY MOVEMENT

MOVEMENT	DEMAND	CAPACITY	RESERVE	LOS	AVG DEL(SEC)	AVG (
LT FROM B:	204	716	512	A	7.04	0
ALL MOVES FROM C:	416	248	-168	F	INFINITE	INFIN

CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
S.HUNTINGTON AVE/ HUNTINGTON AVE
3-AM 98 BUILD
date:03-28-1994 time:14:24:37
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=3AM98B GEOMETRICS=3EX SIGNAL=3AM98B
LOCATED IN CBD:Y

VOLUME & GEOMETRICS

DIR	VOLUMES LT	TH	RT	# OF LANES LT	TH	RT	LANE WIDTH LT	TH	RT	CROSS WALK
EB	0	1174	334	0	2	0	0.0	12.0	0.0	50
WB	155	499	0	1	1	0	12.0	12.0	0.0	60
NB	325	0	230	1	0	1	12.0	0.0	12.0	50
SB	0	0	0	0	0	0	0.0	0.0	0.0	0

TRAFFIC & ROADWAY CONDITIONS

DIR	GRADE	%HV	ADJ Y/N	PARK MOVES	BUSES	PHF	PEDESTRIANS CROSS	BUT	MIN TIME	ARR TYPE
EB	0.0%	5.0%	N	0	0	.940	100	Y	22.0	3
WB	0.0%	7.0%	N	0	0	.910	100	Y	22.0	3
NB	0.0%	4.0%	N	0	10	.880	100	Y	19.5	3
SB	0.0%	0.0%		0	0	.000	0		19.5	0

PHASINGS

	EASTBOUND l	t	r	p	WESTBOUND l	t	r	p	NORTHBOUND l	t	r	p	SOUTHBOUND l	t	r	p	GREEN	Y+R	PRE/ACT
1					*	*					*						10.2	4	A
2		*	*			*											49.0	4	A
3				*				*				*				*	0.0	7	A
4			*			*			*		*						21.8	4	A

CYCLE= 100.0

VOLUME ADJUSTMENT WORKSHEET
PART 1 (MOVEMENT ADJUSTMENTS)

DIR	LTV	THV	RTV	PHF	LTFR	THFR	RTFR
EB	0	1174	334	.940	0	1249	355
WB	155	499	0	.910	170	548	0
NB	325	0	230	.880	369	0	261
SB	0	0	0	.000	0	0	0

PART 2 (LANE GROUP ADJUSTMENTS)

DIR	LN GROUP	FLOW	N	LU	v	Plt	Prt
EB	TH-RT	1604	2	1.05	1684	0.00	0.22
WB	LT	170	1	1.00	170	1.00	0.00
WB	TH	548	1	1.00	548	0.00	0.00
NB	LT	369	1	1.00	369	1.00	0.00
NB	RT	261	1	1.00	261	0.00	1.00

PART 3 (OPPOSING VOLUME ADJUSTMENTS)

LEFT TURN BEING OPPOSED	OPPOSING APPROACH VOLUMES LT	TH	RT	% OPPOSING LEFT TURN LT	TH	RT	# LANES LT	TH	RT	OPPOSING VOLUME
WESTBOUND	0	1249	355	0	0	0	0	2	0	0
NORTHBOUND	0	0	0	0	0	0	0	0	0	0

SATURATION FLOW ADJUSTMENT WORKSHEET

DIR	LN GROUP	IDEAL	N	Fwid	Fhv	Fgr	Fpark	Fbus	Farea	Frt	Flt	s
EB	TH-RT	1800	2	1.000	0.976	1.000	1.000	1.000	0.900	0.967	1.000	3056
WB	LT	1800	1	1.000	0.966	1.000	1.000	1.000	0.900	1.000	0.950	1487
WB	TH	1800	1	1.000	0.966	1.000	1.000	1.000	0.900	1.000	1.000	1565
NB	LT	1800	1	1.000	0.980	1.000	1.000	1.000	0.900	1.000	0.950	1509
NB	RT	1800	1	1.000	0.980	1.000	1.000	0.958	0.900	0.850	1.000	1294

CAPACITY ANALYSIS WORKSHEET

DIR	LN GROUP	v	s	v/s	g/C	c	v/c	CRITICAL
EB	TH-RT	1684	3056	0.55	0.49	1497	1.13	*
WB	LT	170	1487	0.11	0.10	152	1.12	*
WB	TH	548	1565	0.35	0.89	1393	0.39	
NB	LT	369	1509	0.24	0.22	329	1.12	*
NB	RT	261	1294	0.20	0.36	466	0.56	

CYCLE=100.0   LOST=19.0   SUM V/S CRIT= 0.91 TOTAL V/C= 1.12

LEVEL OF SERVICE WORKSHEET

DIR	LN GROUP	v/c	g/C	C	d1	c	d2	PF	Delay	LOS	Avg Q	95% (
EB	TH-RT	1.13	0.49	100.0	22.03	1497	63.78	0.85	72.94	F	43.9	
WB	LT	1.12	0.10	100.0	34.61	152	106.43	1.00	141.04	F	8.8	
WB	TH	0.39	0.89	100.0	0.71	1393	0.10	0.85	0.69	A	1.7	
NB	LT	1.12	0.22	100.0	30.77	329	84.33	1.00	115.09	F	15.8	
NB	RT	0.56	0.36	100.0	19.50	466	1.17	0.85	17.57	C	4.6	

DIR	Delay	LOS
EB	72.94	F
WB	33.95	D
NB	74.68	F

INTERSECTION DELAY = 64.06 INTERSECTION LOS=F

THE CYCLE LENGTH WITHIN THE BOUNDS OF 100 TO 100 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 100.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE 457.3 SECONDS
for chosen cycle length 100.0
suggested timing phase 1 is 10.2 secs green, 4.0 secs yellow + red clear
suggested timing phase 2 is 49.0 secs green, 4.0 secs yellow + red clear
suggested timing phase 3 is 0.0 secs green, 7.0 secs yellow + red clear
suggested timing phase 4 is 21.8 secs green, 4.0 secs yellow + red clear

CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
S.HUNTINGTON AVE/ HUNTINGTON AVE
3-PM 98 BUILD
date:03-28-1994 time:14:27:47
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=3PM98B GEOMETRICS=3EX SIGNAL=3PM98B
LOCATED IN CBD:Y

VOLUME & GEOMETRICS

	VOLUMES			# OF LANES			LANE WIDTH			CROSS
DIR	LT	TH	RT	LT	TH	RT	LT	TH	RT	WALK
EB	0	663	336	0	2	0	0.0	12.0	0.0	50
WB	253	1011	0	1	1	0	12.0	12.0	0.0	60
NB	326	0	172	1	0	1	12.0	0.0	12.0	50
SB	0	0	0	0	0	0	0.0	0.0	0.0	0

TRAFFIC & ROADWAY CONDITIONS

			ADJ	PARK			PEDESTRIANS			ARR
DIR	GRADE	%HV	Y/N	MOVES	BUSES	PHF	CROSS	BUT	MIN TIME	TYPE
EB	0.0%	7.0%	N	0	0	.940	100	Y	22.0	3
WB	0.0%	5.0%	N	0	0	.930	100	Y	22.0	3
NB	0.0%	4.0%	N	0	10	.830	100	Y	19.5	3
SB	0.0%	0.0%		0	0	.000	0		19.5	0

PHASINGS

	EASTBOUND				WESTBOUND				NORTHBOUND				SOUTHBOUND				GREEN	Y+R	PRE/ACT
	l	t	r	p	l	t	r	p	l	t	r	p	l	t	r	p			
1					*	*					*						18.0	4	A
2		*	*			*											37.3	4	A
3				*				*				*				*	0.0	7	A
4			*			*			*		*						25.8	4	A

CYCLE= 100.0

VOLUME ADJUSTMENT WORKSHEET
PART 1 (MOVEMENT ADJUSTMENTS)

DIR	LTV	THV	RTV	PHF	LTFR	THFR	RTFR
EB	0	663	336	.940	0	705	357
WB	253	1011	0	.930	272	1087	0
NB	326	0	172	.830	393	0	207
SB	0	0	0	.000	0	0	0

PART 2 (LANE GROUP ADJUSTMENTS)

DIR	LN GROUP	FLOW	N	LU	v	Plt	Prt
EB	TH-RT	1063	2	1.05	1116	0.00	0.34
WB	LT	272	1	1.00	272	1.00	0.00
WB	TH	1087	1	1.00	1087	0.00	0.00
NB	LT	393	1	1.00	393	1.00	0.00
NB	RT	207	1	1.00	207	0.00	1.00

PART 3 (OPPOSING VOLUME ADJUSTMENTS)

LEFT TURN	OPPOSING APPROACH									
BEING OPPOSED	VOLUMES			% OPPOSING LEFT TURN			# LANES			OPPOSING
	LT	TH	RT	LT	TH	RT	LT	TH	RT	VOLUME
WESTBOUND	0	705	357	0	0	0	0	2	0	0
NORTHBOUND	0	0	0	0	0	0	0	0	0	0

SATURATION FLOW ADJUSTMENT WORKSHEET

DIR	LN GROUP	IDEAL	N	Fwid	Fhv	Fgr	Fpark	Fbus	Farea	Frt	Flt	s
EB	TH-RT	1800	2	1.000	0.966	1.000	1.000	1.000	0.900	0.950	1.000	2973
WB	LT	1800	1	1.000	0.976	1.000	1.000	1.000	0.900	1.000	0.950	1501
WB	TH	1800	1	1.000	0.976	1.000	1.000	1.000	0.900	1.000	1.000	1580
NB	LT	1800	1	1.000	0.980	1.000	1.000	1.000	0.900	1.000	0.950	1509
NB	RT	1800	1	1.000	0.980	1.000	1.000	0.958	0.900	0.850	1.000	1294

CAPACITY ANALYSIS WORKSHEET

DIR	LN GROUP	v	s	v/s	g/C	c	v/c	CRITICAL
EB	TH-RT	1116	2973	0.38	0.37	1108	1.01	*
WB	LT	272	1501	0.18	0.18	270	1.01	*
WB	TH	1087	1580	0.69	0.89	1407	0.77	
NB	LT	393	1509	0.26	0.26	389	1.01	*
NB	RT	207	1294	0.16	0.48	618	0.34	

CYCLE=100.0 LOST=19.0 SUM V/S CRIT= 0.82 TOTAL V/C= 1.01

LEVEL OF SERVICE WORKSHEET

DIR	LN GROUP	v/c	g/C	C	d1	c	d2	PF	Delay	LOS	Avg Q	95% (
EB	TH-RT	1.01	0.37	100.0	23.95	1108	22.55	0.85	39.53	D	20.9	
WB	LT	1.01	0.18	100.0	31.22	270	44.26	1.00	75.48	F	8.8	
WB	TH	0.77	0.89	100.0	1.47	1407	1.92	0.85	2.88	A	3.3	
NB	LT	1.01	0.26	100.0	28.32	389	37.97	1.00	66.29	F	11.3	
NB	RT	0.34	0.48	100.0	12.36	618	0.13	0.85	10.61	B	3.0	

DIR	Delay	LOS
EB	39.53	D
WB	17.41	C
NB	47.06	E

INTERSECTION DELAY = 31.22 INTERSECTION LOS=D

THE CYCLE LENGTH WITHIN THE BOUNDS OF 100 TO 100 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 100.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE 135.6 SECONDS
for chosen cycle length 100.0
suggested timing phase 1 is 18.0 secs green, 4.0 secs yellow + red clear
suggested timing phase 2 is 37.2 secs green, 4.0 secs yellow + red clear
suggested timing phase 3 is 0.0 secs green, 7.0 secs yellow + red clear
suggested timing phase 4 is 25.8 secs green, 4.0 secs yellow + red clear

CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
HUNTINGTON AVE/PARKER HILL AVE
4-AM 98 BUILD
date:03-28-1994 time:14:33:06
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=4AM98B GEOMETRICS=4EX SIGNAL=4AM98B
LOCATED IN CBD:Y

VOLUME & GEOMETRICS

	VOLUMES			# OF LANES			LANE WIDTH			CROSS
DIR	LT	TH	RT	LT	TH	RT	LT	TH	RT	WALK
EB	0	993	60	0	2	0	0.0	13.0	0.0	50
WB	65	467	0	0	2	0	0.0	14.0	0.0	50
NB	43	0	49	0	1	0	0.0	11.0	0.0	25
SB	0	0	0	0	0	0	0.0	0.0	0.0	0

TRAFFIC & ROADWAY CONDITIONS

			ADJ	PARK			PEDESTRIANS			ARR
DIR	GRADE	%HV	Y/N	MOVES	BUSES	PHF	CROSS	BUT	MIN TIME	TYPE
EB	0.0%	7.0%	N	0	7	.910	100	Y	19.5	3
WB	0.0%	14.0%	N	0	7	.910	100	Y	19.5	3
NB	0.0%	11.0%	N	0	0	.810	50	Y	9.3	3
SB	0.0%	0.0%		0	0	.000	0		9.3	0

PHASINGS

	EASTBOUND				WESTBOUND				NORTHBOUND				SOUTHBOUND				GREEN	Y+R	PRE/ACT
	l	t	r	p	l	t	r	p	l	t	r	p	l	t	r	p			
1		*	*		*	*						*					60.0	4	A
2									*		*						22.0	4	A
3				*				*				*					0.0	10	A

CYCLE= 100.0

VOLUME ADJUSTMENT WORKSHEET
PART 1 (MOVEMENT ADJUSTMENTS)

DIR	LTV	THV	RTV	PHF	LTFR	THFR	RTFR
EB	0	993	60	.910	0	1091	66
WB	65	467	0	.910	71	513	0
NB	43	0	49	.810	53	0	60
SB	0	0	0	.000	0	0	0

PART 2 (LANE GROUP ADJUSTMENTS)

DIR	LN GROUP	FLOW	N	LU	v	Plt	Prt
EB	TH-RT	1157	2	1.05	1215	0.00	0.06
WB	LT-TH	585	2	1.05	614	0.12	0.00
NB	LT-RT	114	1	1.00	114	0.47	0.53

PART 3 (OPPOSING VOLUME ADJUSTMENTS)

LEFT TURN	OPPOSING APPROACH									
BEING OPPOSED	VOLUMES			% OPPOSING LEFT TURN			# LANES			OPPOSING
	LT	TH	RT	LT	TH	RT	LT	TH	RT	VOLUME
WESTBOUND	0	1091	66	100	100	100	0	2	0	1157
NORTHBOUND	0	0	0	0	0	0	0	0	0	0

SATURATION FLOW ADJUSTMENT WORKSHEET

DIR	LN GROUP	IDEAL	N	Fwid	Fhv	Fgr	Fpark	Fbus	Farea	Frt	Flt	s
EB	TH-RT	1800	2	1.033	0.966	1.000	1.000	0.985	0.900	0.990	1.000	3156
WB	LT-TH	1800	2	1.067	0.935	1.000	1.000	0.985	0.900	1.000	0.590	1877
NB	LT-RT	1800	1	0.967	0.948	1.000	1.000	1.000	0.900	0.803	0.815	971

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT
INPUT VARIABLES

DIR	C	G	N	Va	Vm	Vlt	Plt	No	Vo	Plto
WB	100	60	2	585	585	71	0.12	2	1157	0.00

CALCULATIONS

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DIR Sop    Yo     Gu     Fs     Pl     Gq     Pt     Gf         El     Fm    Flt
WB 3600 0.321 41.053 0.152 0.805 18.947 0.195  0.484      7.412 0.179 0.590

CAPACITY ANALYSIS WORKSHEET
DIR LN GROUP     v     s  v/s  g/C     c  v/c  CRITICAL
EB  TH-RT     1215 3156 0.38 0.60 1894 0.64     *
WB  LT-TH      614 1877 0.33 0.60 1126 0.55
NB  LT-RT      114  971 0.12 0.22  214 0.53     *

CYCLE=100.0  LOST=18.0  SUM V/S CRIT= 0.50 TOTAL V/C= 0.61

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c  g/C   C      d1    c       d2   PF   Delay LOS Avg Q  95% (
EB  TH-RT     0.64 0.60 100.0   9.89 1894     0.53 0.85    8.86  B  12.9
WB  LT-TH     0.55 0.60 100.0   9.04 1126     0.43 0.85    8.05  B   6.5
NB  LT-RT     0.53 0.22 100.0  26.18  214     2.00 1.00   28.18  D   2.5

DIR Delay LOS
EB   8.86  B
WB   8.05  B
NB  28.18  D
INTERSECTION DELAY =  9.73 INTERSECTION LOS=B

THE CYCLE LENGTH WITHIN THE BOUNDS OF  100  TO  100 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 100.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE  38.2 SECONDS
for chosen cycle length 100.0
suggested timing phase 1 is  62.9 secs green,   4.0 secs yellow + red clear
suggested timing phase 2 is  19.1 secs green,   4.0 secs yellow + red clear
suggested timing phase 3 is   0.0 secs green,  10.0 secs yellow + red clear
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CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
HUNTINGTON AVE/PARKER HILL AVE
4-PM 98 BUILD
date:03-28-1994 time:14:35:03
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=4PM98B GEOMETRICS=4EX SIGNAL=4PM98B
LOCATED IN CBD:Y

VOLUME & GEOMETRICS

	VOLUMES			# OF LANES			LANE WIDTH			CROSS
DIR	LT	TH	RT	LT	TH	RT	LT	TH	RT	WALK
EB	0	769	51	0	2	0	0.0	13.0	0.0	50
WB	67	974	0	0	2	0	0.0	14.0	0.0	50
NB	112	0	61	0	1	0	0.0	11.0	0.0	25
SB	0	0	0	0	0	0	0.0	0.0	0.0	0

TRAFFIC & ROADWAY CONDITIONS

			ADJ	PARK			PEDESTRIANS			ARR
DIR	GRADE	%HV	Y/N	MOVES	BUSES	PHF	CROSS	BUT	MIN TIME	TYPE
EB	0.0%	9.0%	N	0	7	.900	100	Y	19.5	3
WB	0.0%	6.0%	N	0	7	.880	100	Y	19.5	3
NB	0.0%	2.0%	N	0	0	.710	50	Y	9.3	3
SB	0.0%	0.0%		0	0	.000	0		9.3	0

PHASINGS

	EASTBOUND				WESTBOUND				NORTHBOUND				SOUTHBOUND				GREEN	Y+R	PRE/ACT
	l	t	r	p	l	t	r	p	l	t	r	p	l	t	r	p			
1		*	*		*	*						*					55.6	4	A
2									*		*						26.4	4	A
3				*				*				*					0.0	10	A

CYCLE= 100.0

VOLUME ADJUSTMENT WORKSHEET
PART 1 (MOVEMENT ADJUSTMENTS)

DIR	LTV	THV	RTV	PHF	LTFR	THFR	RTFR
EB	0	769	51	.900	0	854	57
WB	67	974	0	.880	76	1107	0
NB	112	0	61	.710	158	0	86
SB	0	0	0	.000	0	0	0

PART 2 (LANE GROUP ADJUSTMENTS)

DIR	LN GROUP	FLOW	N	LU	v	Plt	Prt
EB	TH-RT	911	2	1.05	957	0.00	0.06
WB	LT-TH	1183	2	1.05	1242	0.06	0.00
NB	LT-RT	244	1	1.00	244	0.65	0.35

PART 3 (OPPOSING VOLUME ADJUSTMENTS)

LEFT TURN	OPPOSING APPROACH									
BEING OPPOSED	VOLUMES			% OPPOSING LEFT TURN			# LANES			OPPOSING
	LT	TH	RT	LT	TH	RT	LT	TH	RT	VOLUME
WESTBOUND	0	854	57	100	100	100	0	2	0	911
NORTHBOUND	0	0	0	0	0	0	0	0	0	0

SATURATION FLOW ADJUSTMENT WORKSHEET

DIR	LN GROUP	IDEAL	N	Fwid	Fhv	Fgr	Fpark	Fbus	Farea	Frt	Flt	s
EB	TH-RT	1800	2	1.033	0.957	1.000	1.000	0.985	0.900	0.989	1.000	3123
WB	LT-TH	1800	2	1.067	0.971	1.000	1.000	0.985	0.900	1.000	0.776	2564
NB	LT-RT	1800	1	0.967	0.990	1.000	1.000	1.000	0.900	0.836	0.782	1013

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT
INPUT VARIABLES

DIR	C	G	N	Va	Vm	Vlt	Plt	No	Vo	Plto
WB	100	56	2	1183	1183	76	0.06	2	911	0.00

CALCULATIONS

DIR	Sop	Yo	Gu	Fs	Pl	Gq	Pt	Gf	El	Fm	Flt
WB	3600	0.253	40.597	0.306	0.276	15.034	0.724	4.780	3.682	0.551	0.776

CAPACITY ANALYSIS WORKSHEET

DIR	LN GROUP	v	s	v/s	g/C	c	v/c	CRITICAL
EB	TH-RT	957	3123	0.31	0.56	1737	0.55	
WB	LT-TH	1242	2564	0.48	0.56	1427	0.87	*
NB	LT-RT	244	1013	0.24	0.26	267	0.91	*

CYCLE=100.0 LOST=18.0 SUM V/S CRIT= 0.72 TOTAL V/C= 0.88

LEVEL OF SERVICE WORKSHEET

DIR	LN GROUP	v/c	g/C	C	d1	c	d2	PF	Delay	LOS	Avg Q	95% (
EB	TH-RT	0.55	0.56	100.0	10.78	1737	0.29	0.85	9.42	B	11.2	
WB	LT-TH	0.87	0.56	100.0	14.51	1427	4.39	0.85	16.06	C	14.6	
NB	LT-RT	0.91	0.26	100.0	27.13	267	23.33	1.00	50.45	E	5.9	

DIR	Delay	LOS
EB	9.42	B
WB	16.06	C
NB	50.45	E

INTERSECTION DELAY = 16.89 INTERSECTION LOS=C

THE CYCLE LENGTH WITHIN THE BOUNDS OF 100 TO 100 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 100.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE 76.0 SECONDS
for chosen cycle length 100.0
suggested timing phase 1 is 54.8 secs green, 4.0 secs yellow + red clear
suggested timing phase 2 is 27.2 secs green, 4.0 secs yellow + red clear
suggested timing phase 3 is 0.0 secs green, 10.0 secs yellow + red clear

CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
TREMONT ST/PARKER ST
5-AM 98 BUILD
date:03-28-1994 time:15:14:17
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=5AM98B GEOMETRICS=5EX SIGNAL=5AM98B
LOCATED IN CBD:Y

VOLUME & GEOMETRICS

DIR	VOLUMES LT	TH	RT	# OF LANES LT	TH	RT	LANE WIDTH LT	TH	RT	CROSS WALK
EB	36	468	31	0	1	0	0.0	15.0	0.0	40
WB	58	642	151	0	2	0	0.0	15.0	0.0	40
NB	0	0	0	0	0	0	0.0	0.0	0.0	0
SB	74	47	22	0	1	0	0.0	10.0	0.0	30

TRAFFIC & ROADWAY CONDITIONS

DIR	GRADE	%HV	ADJ PARK Y/N	MOVES	BUSES	PHF	PEDESTRIANS CROSS	BUT	MIN TIME	ARR TYPE
EB	0.0%	4.0%	N	0	5	.920	100	Y	17.0	3
WB	0.0%	3.0%	Y	0	5	.910	100	Y	17.0	3
NB	0.0%	0.0%		0	0	.000	0		14.5	0
SB	0.0%	4.0%	Y	0	0	.890	50	Y	14.5	3

PHASINGS

	EASTBOUND l	t	r	p	WESTBOUND l	t	r	p	NORTHBOUND l	t	r	p	SOUTHBOUND l	t	r	p	GREEN	Y+R	PRE/ACT
1	*	*	*		*	*	*										61.3	4	A
2													*	*	*		19.7	4	A
3				*				*				*				*	0.0	11	A

CYCLE= 100.0

VOLUME ADJUSTMENT WORKSHEET
PART 1 (MOVEMENT ADJUSTMENTS)

DIR	LTV	THV	RTV	PHF	LTFR	THFR	RTFR
EB	36	468	31	.920	39	509	34
WB	58	642	151	.910	64	705	166
NB	0	0	0	.000	0	0	0
SB	74	47	22	.890	83	53	25

PART 2 (LANE GROUP ADJUSTMENTS)

DIR	LN GROUP	FLOW	N	LU	v	Plt	Prt
EB	LT-TH-RT	582	1	1.00	582	0.07	0.06
WB	LT-TH-RT	935	2	1.05	982	0.07	0.18
SB	LT-TH-RT	161	1	1.00	161	0.52	0.15

PART 3 (OPPOSING VOLUME ADJUSTMENTS)

LEFT TURN BEING OPPOSED	OPPOSING APPROACH VOLUMES LT	TH	RT	% OPPOSING LEFT TURN LT	TH	RT	# LANES LT	TH	RT	OPPOSING VOLUME
EASTBOUND	64	705	166	100	100	100	0	2	0	935
WESTBOUND	39	509	34	100	100	100	0	1	0	542
SOUTHBOUND	0	0	0	0	0	0	0	0	0	0

SATURATION FLOW ADJUSTMENT WORKSHEET

DIR	LN GROUP	IDEAL	N	Fwid	Fhv	Fgr	Fpark	Fbus	Farea	Frt	Flt	s
EB	LT-TH-RT	1800	1	1.100	0.980	1.000	1.000	0.979	0.900	0.892	0.852	1300
WB	LT-TH-RT	1800	2	1.100	0.985	1.000	1.000	0.990	0.900	0.973	0.829	2803
SB	LT-TH-RT	1800	1	0.933	0.980	1.000	1.000	1.000	0.900	0.872	0.805	1041

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT
INPUT VARIABLES

DIR	C	G	N	Va	Vm	Vlt	Plt	No	Vo	Plto
EB	100	61	1	582	542	39	0.07	2	935	0.07

```
WB 100  61  2  935  935   64 0.07  1  542 0.07
CALCULATIONS
DIR Sop    Yo     Gu     Fs    Pl     Gq    Pt     Gf       El    Fm   Flt
EB 3349 0.279 46.246 0.291 0.067 15.009 0.933 11.287    3.872 0.852 0.852
WB 1508 0.360 39.502 0.536 0.231 21.753 0.769  6.282    2.099 0.657 0.829

CAPACITY ANALYSIS WORKSHEET
DIR LN GROUP    v    s  v/s  g/C    c  v/c  CRITICAL
EB  LT-TH-RT  582 1300 0.45 0.61  796 0.73     *
WB  LT-TH-RT  982 2803 0.35 0.61 1717 0.57
SB  LT-TH-RT  161 1041 0.15 0.20  206 0.78     *

CYCLE=100.0  LOST=19.0  SUM V/S CRIT= 0.60 TOTAL V/C= 0.74

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP v/c  g/C   C     d1    c      d2   PF   Delay LOS Avg Q  95%
EB  LT-TH-RT 0.73 0.61 100.0  10.32  796    2.39 0.85   10.81  B    6.3
WB  LT-TH-RT 0.57 0.61 100.0   8.78 1717    0.35 0.85    7.76  B  10.1
SB  LT-TH-RT 0.78 0.20 100.0  28.94  206   11.74 0.85   34.58  D    3.6

DIR Delay LOS
EB  10.81  B
WB   7.76  B
SB  34.58  D
INTERSECTION DELAY = 11.29 INTERSECTION LOS=B

THE CYCLE LENGTH WITHIN THE BOUNDS OF  100  TO  100 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 100.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE  51.8 SECONDS
for chosen cycle length 100.0
suggested timing phase 1 is  60.2 secs green,   4.0 secs yellow + red clear
suggested timing phase 2 is  20.8 secs green,   4.0 secs yellow + red clear
suggested timing phase 3 is   0.0 secs green,  11.0 secs yellow + red clear
```

CINCH PROGRAM VERSION DATE 4-29-1988
1985 HCM - CHAPTER 9: SIGNALIZED - OPERATIONAL ANALYSIS
TREMONT ST/PARKER ST
5-PM 98 BUILD
date:03-28-1994 time:15:16:31
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=5PM98B GEOMETRICS=5EX SIGNAL=5PM98B
LOCATED IN CBD:Y

VOLUME & GEOMETRICS

	VOLUMES			# OF LANES			LANE WIDTH			CROSS
DIR	LT	TH	RT	LT	TH	RT	LT	TH	RT	WALK
EB	33	569	67	0	1	0	0.0	15.0	0.0	40
WB	33	480	118	0	2	0	0.0	15.0	0.0	40
NB	0	0	0	0	0	0	0.0	0.0	0.0	0
SB	99	104	25	0	1	0	0.0	10.0	0.0	30

TRAFFIC & ROADWAY CONDITIONS

				ADJ PARK			PEDESTRIANS			ARR
DIR	GRADE	%HV	Y/N	MOVES	BUSES	PHF	CROSS	BUT	MIN TIME	TYPE
EB	0.0%	3.0%	N	0	5	.900	100	Y	17.0	3
WB	0.0%	2.0%	Y	0	5	.850	100	Y	17.0	3
NB	0.0%	0.0%		0	0	.000	0		14.5	0
SB	0.0%	1.0%	Y	0	0	.780	50	Y	14.5	3

PHASINGS

	EASTBOUND				WESTBOUND				NORTHBOUND				SOUTHBOUND				GREEN	Y+R	PRE/ACT
	l	t	r	p	l	t	r	p	l	t	r	p	l	t	r	p			
1	*	*	*		*	*	*										53.2	4	A
2													*	*	*		27.8	4	A
3				*				*				*				*	0.0	11	A

CYCLE= 100.0

VOLUME ADJUSTMENT WORKSHEET
PART 1 (MOVEMENT ADJUSTMENTS)

DIR	LTV	THV	RTV	PHF	LTFR	THFR	RTFR
EB	33	569	67	.900	37	632	74
WB	33	480	118	.850	39	565	139
NB	0	0	0	.000	0	0	0
SB	99	104	25	.780	127	133	32

PART 2 (LANE GROUP ADJUSTMENTS)

DIR	LN GROUP	FLOW	N	LU	v	Plt	Prt
EB	LT-TH-RT	743	1	1.00	743	0.05	0.10
WB	LT-TH-RT	742	2	1.05	779	0.05	0.19
SB	LT-TH-RT	292	1	1.00	292	0.43	0.11

PART 3 (OPPOSING VOLUME ADJUSTMENTS)

LEFT TURN	OPPOSING APPROACH									
BEING OPPOSED	VOLUMES			% OPPOSING LEFT TURN			# LANES			OPPOSING
	LT	TH	RT	LT	TH	RT	LT	TH	RT	VOLUME
EASTBOUND	39	565	139	100	100	100	0	2	0	742
WESTBOUND	37	632	74	100	100	100	0	1	0	707
SOUTHBOUND	0	0	0	0	0	0	0	0	0	0

SATURATION FLOW ADJUSTMENT WORKSHEET

DIR	LN GROUP	IDEAL	N	Fwid	Fhv	Fgr	Fpark	Fbus	Farea	Frt	Flt	s
EB	LT-TH-RT	1800	1	1.100	0.985	1.000	1.000	0.979	0.900	0.886	0.937	1427
WB	LT-TH-RT	1800	2	1.100	0.990	1.000	1.000	0.990	0.900	0.972	0.694	2354
SB	LT-TH-RT	1800	1	0.933	0.995	1.000	1.000	1.000	0.900	0.880	0.821	1087

SUPPLEMENTAL WORKSHEET FOR LEFT-TURN ADJUSTMENT FACTOR FLT
INPUT VARIABLES

DIR	C	G	N	Va	Vm	Vlt	Plt	No	Vo	Plto
EB	100	53	1	743	707	37	0.05	2	742	0.05

```
WB 100  53  2  742  742   39 0.05  1  707 0.05
CALCULATIONS
DIR Sop    Yo      Gu     Fs     Pl      Gq     Pt      Gf        El     Fm    Flt
EB 3323 0.223 39.730 0.411 0.049 13.466 0.951 11.126    2.737 0.937 0.937
WB 1658 0.426 18.426 0.433 0.275 34.769 0.725  5.250    2.596 0.387 0.694

CAPACITY ANALYSIS WORKSHEET
DIR LN GROUP    v     s  v/s  g/C     c  v/c  CRITICAL
EB  LT-TH-RT  743 1427 0.52 0.53  759 0.98      *
WB  LT-TH-RT  779 2354 0.33 0.53 1252 0.62
SB  LT-TH-RT  292 1087 0.27 0.28  302 0.97      *

CYCLE=100.0  LOST=19.0  SUM V/S CRIT= 0.79 TOTAL V/C= 0.98

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c  g/C   C      d1    c      d2   PF   Delay LOS Avg Q  95%
EB  LT-TH-RT 0.98 0.53 100.0  17.37  759   20.61 0.85   32.28  D  11.5
WB  LT-TH-RT 0.62 0.53 100.0  12.44 1252    0.70 0.85   11.17  B   9.7
SB  LT-TH-RT 0.97 0.28 100.0  27.10  302   31.78 0.85   50.05  E   7.0

DIR Delay LOS
EB  32.28  D
WB  11.17  B
SB  50.05  E
INTERSECTION DELAY = 26.08 INTERSECTION LOS=D

THE CYCLE LENGTH WITHIN THE BOUNDS OF  100  TO  100 SECONDS
WHICH MINIMIZES CRITICAL MOVEMENT DELAY IS 100.0 SECONDS

FOR A V/C RATIO OF .95 THE CYCLE SHOULD BE 112.7 SECONDS
for chosen cycle length 100.0
suggested timing phase 1 is  53.4 secs green,   4.0 secs yellow + red clear
suggested timing phase 2 is  27.6 secs green,   4.0 secs yellow + red clear
suggested timing phase 3 is   0.0 secs green,  11.0 secs yellow + red clear
```

APPENDIX D

Air Quality Technical Analysis

APPENDIX D
AIR QUALITY TECHNICAL ANALYSIS

D.1 Introduction

A microscale modeling study was conducted to address the air quality effects of motor vehicles from the proposed Ambulatory Care Building and Parking Structure. The analysis evaluated carbon monoxide (CO) emissions and resulting concentrations at sensitive receptor locations in the project area. The study was based on a modeling protocol developed in cooperation with the Boston Redevelopment Authority (BRA)[1] and Massachusetts Department of Environmental Protection (DEP).[2]

D.2 Microscale Analysis

The objective of the microscale analysis was to determine if the Project will cause or increase any predicted exceedances of the Massachusetts and National Ambient Air Quality Standards (NAAQS) for carbon monoxide. CO is used to indicate roadway air pollutant levels since it is the most abundant pollutant emitted by motor vehicles and can result in "hot spot" locations around congested intersections. The primary CO standards, designed to protect the public health, set a maximum concentration of 35 parts per million (ppm) for a one-hour period, and 9 ppm for eight hours, each not to be exceeded more than once per year.

BRA/DEP study criteria requires that an intersection be evaluated if project related traffic increases by 10% and the overall intersection operates at Level-of-Service (LOS) D, or if it operates at LOS E or F and the Project will cause the intersection to degrade. Based on these criteria, the following intersections were evaluated:

- Huntington Avenue/South Huntington Avenue
- South Huntington Avenue/Heath Street

Huntington Avenue at South Huntington Avenue is a signalized intersection, while the intersection of South Huntington Avenue at Heath Street is controlled by a "Yield" sign on Heath Street.

At the intersection of Heath Street and Parker Street, the left turn from Parker to Heath also fails the LOS analysis during the peak PM period. This location was not studied since the intersection is unsignalized and the Project only adds one new trip. Further, because CO concentrations at the two study locations noted above demonstrated acceptable levels, air quality exceedances are not expected at the Heath Street/Parker Street location.

To determine air quality levels, areas of human activity (sensitive receptors) exposed to maximum air pollutant levels from motor vehicle emissions in the project area were identified. The geometry of the two intersections modeled along with the sensitive receptor locations are shown in Figures IV.2-1 and IV.2-2 of the main report. Consistent with EPA Guidelines[3,6], receptor locations were situated where maximum CO concentrations are likely to occur (i.e., near intersection vehicle queues), and where the general public is likely to have access. Using air quality modeling techniques, the analysis calculated maximum one- and eight-hour CO concentrations at sensitive receptor locations. The analysis examined the following cases:

Case	Year	Project Status
1	1994	Existing
2	1998	No Build
3	1998	Build

For each case, the recommended EPA computer programs MOBILE5a[4] and CAL3QHC[5] were used to calculate CO motor vehicle emissions and concentrations at receptors.

D.2.1 Motor Vehicle Emissions

Motor vehicle emissions used in this analysis were generated by the EPA MOBILE5a[4] computer program. MOBILE5a is a computer program that provides estimates of carbon monoxide (CO) emission factors for gasoline-fueled and diesel highway motor vehicles. Free flow values were taken directly from model output, while idle mode factors (in gm/hr) were calculated using the EPA recommended method of multiplying the 2.5 mph emission values, in gm/mile, by 2.5 mph.

Emission estimates depend on various conditions such as ambient temperature, speed, and mileage accrual rates. Modeling incorporated the following DEP recommended inputs:

- Default Tampering Rates
- Default Vehicle Miles Traveled Mix
- Default Mileage Accrual Rates
- Massachusetts Specific Registration Distribution (dated 8/93)

- Default Basic Emission Rates (BERs)
- Inspection/Maintenance Program:
  - Start Year: 1983
  - Stringency Factor: 12%
  - First Model Year: Analysis Year Minus 14
  - Last Model Year: 2020
  - Pre-81 and Post-81 Waiver Rates: 1%
  - Compliance Rate: 85%
  - Inspection Type: Computerized Test and Repair
  - Annual Inspection
  - Vehicle Types: LDGV, LDGT1, LDGT2
  - Test Type: Idle
  - No Alternative Credits
  - No Transient, Purge or Pressure Check modeled
- No Emission Correction Factors
- No Anti-tampering Program.
- Stage II Program:
  - Start Year: 1991
  - Phase In Period: 3 Years
  - 95% System Efficiency for All Vehicle Types
- Minimum Daily Temperature of 29°F, Maximum of 30°F
- Base and In Use RVP of 13.5 psi
- LAP "Period 2" Start Year: 1989
- No Oxygenated Fuel or Diesel Sales Fraction Modeled
- Calculate Daily Temperature Averages
- Volatile Organic Compounds Selected
- Low Altitude Region Selected
- Ambient Temperature 30.0°F
- 20.6% Cold/27.3% Hot Start Operating Mode Fractions
- One Average Speed all Vehicle Types per Roadway

MOBILE5a model output is included as Attachment D1.

D.2.2 Traffic Data

Peak one-hour traffic volumes and turning movements based on the traffic component were used in the analysis. These data were used to assess one-hour CO concentrations. Free flow roadway speeds utilized in the study were 20 mph for Huntington Avenue and the Project's driveway, 25 mph for South Huntington Avenue and Heath Street, and 15 mph for the parking facilities.

For the peak eight-hour period, roadway concentrations were calculated using an eight-hour to one-hour ratio (or persistence factor) of 0.70 as recommended by EPA[6] and DEP[7]. This persistence factor accounts for the variability in meteorology over an eight-hour period as compared to one-hour conditions. Eight-hour concentrations were calculated by multiplying predicted one-hour levels by this persistence factor.

D.2.3 CO Modeling Analysis

The EPA CAL3QHC[5] (Version 2) computer program was used to predict CO concentrations at sensitive receptor locations. The CAL3QHC program utilizes the FHWA CALINE3 line source dispersion model[8] and a routine that internally estimates the length of the queues of vehicles at signalized intersections. CAL3QHC evaluates air pollution concentrations near highways and arterial streets due to emissions from motor vehicles operating under free flow conditions and emissions from idling vehicles from queues at intersections.

CAL3QHC requires input of roadway geometries, receptor locations, meteorological conditions, signal timings, traffic volumes and vehicular emission rates. The following meteorological data and inputs were used:

- P-G Stability Class D.
- 1.0 meter per second (m/s) wind speed.
- Wind direction modeled every 10°.
- Mixing Height: Winter average height of 1,000 meters.
- Deposition/Settling Velocity: 0.0 m/s.
- Surface Roughness (z_0): 175 cm (Office)
- Averaging Time: 60 minutes.

- Source Height: 0.33 meters.
- Mixing Zone for Free Flow Links: Width of traffic lanes plus 3 meters (10 feet) on each side.

D.2.4 Parking Facilities

Air quality impacts associated with the Project's open Parking Structure and surface lot were also considered. CO concentrations from the parking facilities were predicted using the MOBILE5a and CAL3QHC programs, and the routing of vehicles within the facilities. The free flow speed modeled within the parking areas was 15 mph, while 20 mph was used for the roadway leading in and out of the facilities. Results were then combined with concentrations at receptors around the South Huntington Avenue/Heath Street intersection. In addition, CO concentrations were also evaluated at 12 closer receptors in the vicinity of the parking areas (see Figure IV.2-3 of the main report). Parking facility contributions were not considered at the Huntington Avenue/South Huntington Avenue intersection because of the distance to this location.

D.2.5 Background Air Quality

An air quality analysis also requires an estimate of "background" air quality levels, representing the contribution of all sources in the project area less the specific intersections and parking facilities analyzed. Background levels of 5.0 ppm for the peak one-hour and 3.0 ppm for the peak eight-hour were used for the existing year 1994. For the future year (1998), background levels were scaled from 1994 to 1998 based on increases in background traffic and reductions in motor vehicle emissions. Based on a traffic increase of 4.1% over the four year period from 1994 to 1998 (1% per year) and an emissions decrease of approximately 17.8%, future year background levels of 4.3 ppm (one-hour) and 2.6 ppm (eight-hour) were calculated.

D.2.6 Results of Microscale Analysis

Maximum predicted one- and eight-hour CO concentrations at sensitive receptor locations for each modeled scenario are presented in Tables D-1 and D-2. These values represent highest potential concentrations as they are predicted during the simultaneous occurrence of "defined" worst-case meteorology and peak traffic conditions. Total concentration results are based on the contribution from intersections studied, the proposed parking facilities, and background The results in Tables D-1 and D-2 indicate no exceedances of the one- or eight hour NAAQS for CO with construction of the Project.

REFERENCES

1. Personal Communication, Mr. Richard Mertens, Boston Redevelopment Authority, March 17 and 22, 1994.

2. Personal Communication, Mr. Keith Grillo, MA DEP, Division of Air Quality Control, March 17 and 22, 1994.

3. EPA, *Guideline for Air Quality Maintenance Planning and Analysis Volume 9 (Revised); Evaluating Indirect Sources,* EPA-450/4-78-001, September, 1978.

4. EPA, *User's Guide to MOBILE5a (Mobile Source Emissions Factor Model),* March, 1993.

5. EPA, *User's Guide to CAL3QHC, Version 2.0: A Modeling Methodology For Predicting Pollutant Concentrations Near Roadway Intersections,* EPA-454-92-006, November, 1992.

6. EPA, *Guideline for Modeling Carbon Monoxide from Roadway Intersections*, EPA-454/R-92-005, November, 1992.

7. DEP, *Technicel Memorandum #2: Persistence Factor*, January 26, 1982.

8. Benson, P., *CALINE3 - A Versatile Dispersion Model for Predicting Air Pollutant Levels Near Highways and Arterial Streets,* FHWA/CA/TL-79/23, November, 1979.

Table D-1: Microscale Analysis
Maximum Predicted Ambient CO Concentrations

Intersection	Receptor	Existing 1-Hr	Existing 8-Hr	Future No-Build 1-Hr	Future No-Build 8-Hr	Future Build 1-Hr	Future Build 8-Hr
Huntington Avenue/ South Huntington Avenue	A1	9.6	6.2	8.6	5.6	8.6	5.6
	A2	9.2	5.9	8.0	5.2	8.1	5.3
	A3	9.0	5.8	8.1	5.3	8.1	5.3
	A4	9.1	5.9	8.1	5.3	8.1	5.3
	A5	9.5	6.2	8.5	5.5	8.5	5.5
	A6	8.3	5.3	7.4	4.8	7.4	4.8
	A7	10.0	6.5	9.1	6.0	9.1	6.0
	A8	12.3	8.1	10.8	7.2	10.8	7.2
	A9	10.9	7.1	9.4	6.2	9.4	6.2
	A10	8.5	5.5	7.7	5.0	7.7	5.0
	A11	9.6	6.2	8.5	5.5	8.5	5.5
	A12	11.3	7.4	9.9	6.5	9.9	6.5
	A13	12.1	8.0	10.7	7.1	10.7	7.1
	A14	12.5	8.3	11.0	7.3	11.0	7.3
South Huntington Avenue/ Heath Street	B1	7.0	4.4	6.1	3.9	6.1	3.9
	B2	7.6	4.8	6.3	4.0	6.3	4.0
	B3	8.4	5.4	7.3	4.7	7.3	4.7
	B4	8.6	5.5	7.3	4.7	7.3	4.7
	B5	7.6	4.8	6.5	4.1	6.5	4.1
	B6	9.8	6.4	8.3	5.4	8.3	5.4
	B7	9.8	6.4	8.3	5.4	8.3	5.4
	B8	9.8	6.4	8.3	5.4	8.3	5.4
	B9	9.7	6.3	8.2	5.3	8.2	5.3
	B10	8.6	5.5	7.2	4.6	7.2	4.6
	B11	8.5	5.5	7.2	4.6	7.2	4.6
	B12	6.6	4.1	5.6	3.5	5.6	3.5
NAAQS		**35.0**	**9.0**	**35.0**	**9.0**	**35.0**	**9.0**

Table D-2: **Parking Facility Receptors**

Receptor	Concentration (ppm) 1-Hour	Concentration (ppm) 8-Hour
P1	4.8	3.0
P2	4.6	2.8
P3	4.5	2.7
P4	4.5	2.7
P5	4.5	2.7
P6	4.4	2.7
P7	4.5	2.7
P8	4.6	2.8
P9	5.4	3.4
P10	5.0	3.1
P11	5.2	3.2
P12	5.3	3.3
NAAQS	**35.0**	**9.0**

Attachment D1

MOBILE5a Model Output

```
16778-202   NEW ENGLAND BAPTIST Microscale 1994  3/8/94                    0000000
 MOBILE5a (26-Mar-93)
0
-M 49 Warning:
+               1.00      MYR sum not = 1. (will normalize)
-M 49 Warning:
+               1.00      MYR sum not = 1. (will normalize)
-M111 Error:
+            The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+            The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+            The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M 83 Comment:
+             One or more evaporative temperatures (input daily
              maximum, input ambient, calculated hot soak, and/or
              calculated running loss) is 40F or less, or input
              daily minimum is 25F or less; no evaporative emission
              factors (hot soak, diurnal, running loss, or resting
              loss) will be calculated.
0I/M program selected:

0    Start year (January 1):            1983
     Pre-1981 MYR stringency rate:       12%
     First model year covered:          1980
     Last model year covered:           2020
     Waiver rate (pre-1981):             1.%
     Waiver rate (1981 and newer):       1.%
     Compliance Rate:                   85.%
     Inspection type:                   Computerized Test and Repair
     Inspection frequency               Annual
     Vehicle types covered:             LDGV - Yes
                                       LDGT1 - Yes
                                       LDGT2 - Yes
                                        HDGV - No
     1981 & later MYR test type:        Idle
     Cutpoints, HC:  220.000   CO:    1.200   NOx:  999.000
0Stage II program selected:

0    Start year (January 1):            1991
     Phase-in period (yrs.):               3
     Percent Efficiency for LDGV & LDGT: 95.%
     Percent Efficiency for HDGV:        95.%

01994  NEB MICRO
                  Minimum Temp: 29. (F)   Maximum Temp: 30. (F)
                  Period 1 RVP: 13.5      Period 2 RVP: 13.5 Period 2 Yr: 1989
0VOC HC emission factors include evaporative HC emission factors.
0_______________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1994          Region: Low          Altitude:  500. Ft.
                   I/M Program: Yes       Ambient Temp:   31.3 / 31.3 / 31.3 F
               Anti-tam. Program: No     Operating Mode:   20.6 / 27.3 / 20.6
                Reformulated Gas: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV   MC   All Veh
+           ______ ______ ______ ______ ______ ______ ______ ______ ______ ______
 Veh. Spd.:  2.5    2.5    2.5           2.5    2.5    2.5    2.5    2.5
   VMT Mix:  0.621  0.185  0.086         0.038  0.003  0.001  0.061  0.005
0Composite Emission Factors (Gm/Mile)
 VOC    HC: 15.05  16.40  19.02  17.23  12.95   1.58   2.25   5.30  20.46  14.94
 Exhst  CO:198.41 203.88 236.77 214.31 166.80   5.41   6.24  37.80 254.46 191.25
 Exhst NOX:  3.03   3.32   3.45   3.36   4.73   2.80   3.14  24.84   1.17   4.49
 _______________________________________________________________________________
-M111 Error:
+            The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+            The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+            The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M 83 Comment:
+             One or more evaporative temperatures (input daily
              maximum, input ambient, calculated hot soak, and/or
              calculated running loss) is 40F or less, or input
              daily minimum is 25F or less; no evaporative emission
              factors (hot soak, diurnal, running loss, or resting
              loss) will be calculated.
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1994          Region: Low          Altitude:  500. Ft.
```

```
                  I/M Program: Yes        Ambient Temp:   31.3 / 31.3 / 31.3 F
             Anti-tam. Program: No       Operating Mode:   20.6 / 27.3 / 20.6
              Reformulated Gas: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT    HDGV   LDDV   LDDT   HDDV    MC   All Veh
+           _____  _____  _____  ______  _____  _____  _____  _____  _____  ______
 Veh. Spd.:  5.0    5.0    5.0            5.0    5.0    5.0    5.0    5.0
   VMT Mix:  0.621  0.185  0.086          0.038  0.003  0.001  0.061  0.005
0Composite Emission Factors (Gm/Mile)
 VOC    HC:  8.04   8.86  10.26    9.30  10.33   1.39   1.98   4.66  12.75    8.26
 Exhst  CO:105.74 109.63 126.61 115.01 133.27   4.42   5.09  30.86 146.59 104.57
 Exhst NOX:  2.46   2.69   2.82    2.73   4.85   2.51   2.82  22.32   1.05    3.82
 ____________________________________________________________________________________
-M111 Error:
+            The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+            The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+            The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M 83 Comment:
+             One or more evaporative temperatures (input daily
              maximum, input ambient, calculated hot soak, and/or
              calculated running loss) is 40F or less, or input
              daily minimum is 25F or less; no evaporative emission
              factors (hot soak, diurnal, running loss, or resting
              loss) will be calculated.
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1994           Region: Low           Altitude:  500. Ft.
                  I/M Program: Yes        Ambient Temp:   31.3 / 31.3 / 31.3 F
             Anti-tam. Program: No       Operating Mode:   20.6 / 27.3 / 20.6
              Reformulated Gas: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT    HDGV   LDDV   LDDT   HDDV    MC   All Veh
+           _____  _____  _____  ______  _____  _____  _____  _____  _____  ______
 Veh. Spd.: 10.0   10.0   10.0           10.0   10.0   10.0   10.0   10.0
   VMT Mix:  0.621  0.185  0.086          0.038  0.003  0.001  0.061  0.005
0Composite Emission Factors (Gm/Mile)
 VOC    HC:  4.48   5.00   5.71    5.23   6.79   1.09   1.55   3.66   6.90    4.72
 Exhst  CO: 58.70  61.60  69.34   64.05  88.67   3.05   3.51  21.28  70.42   58.87
 Exhst NOX:  2.18   2.38   2.50    2.42   5.09   2.08   2.34  18.52   0.95    3.34
 ____________________________________________________________________________________
-M111 Error:
+            The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+            The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+            The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M 83 Comment:
+             One or more evaporative temperatures (input daily
              maximum, input ambient, calculated hot soak, and/or
              calculated running loss) is 40F or less, or input
              daily minimum is 25F or less; no evaporative emission
              factors (hot soak, diurnal, running loss, or resting
              loss) will be calculated.
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1994           Region: Low           Altitude:  500. Ft.
                  I/M Program: Yes        Ambient Temp:   31.3 / 31.3 / 31.3 F
             Anti-tam. Program: No       Operating Mode:   20.6 / 27.3 / 20.6
              Reformulated Gas: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT    HDGV   LDDV   LDDT   HDDV    MC   All Veh
+           _____  _____  _____  ______  _____  _____  _____  _____  _____  ______
 Veh. Spd.: 15.0   15.0   15.0           15.0   15.0   15.0   15.0   15.0
   VMT Mix:  0.621  0.185  0.086          0.038  0.003  0.001  0.061  0.005
0Composite Emission Factors (Gm/Mile)
 VOC    HC:  3.30   3.72   4.20    3.87   4.66   0.87   1.25   2.94   4.90    3.48
 Exhst  CO: 43.09  45.73  50.44   47.22  62.33   2.20   2.53  15.36  45.74   43.11
 Exhst NOX:  2.08   2.28   2.40    2.32   5.34   1.79   2.01  15.92   0.97    3.10
 ____________________________________________________________________________________
-M111 Error:
+            The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+            The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+            The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M 83 Comment:
+             One or more evaporative temperatures (input daily
              maximum, input ambient, calculated hot soak, and/or
              calculated running loss) is 40F or less, or input
              daily minimum is 25F or less; no evaporative emission
              factors (hot soak, diurnal, running loss, or resting
```

```
             loss) will be calculated.
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1994           Region: Low          Altitude:  500. Ft.
                      I/M Program: Yes      Ambient Temp:   31.3 / 31.3 / 31.3 F
                 Anti-tam. Program: No     Operating Mode:  20.6 / 27.3 / 20.6
                  Reformulated Gas: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT    HDGV   LDDV   LDDT   HDDV    MC   All Veh
+           ------ ------ ------ ------  ------ ------ ------ ------ ------ ------
 Veh. Spd.: 20.0   20.0   20.0           20.0   20.0   20.0   20.0   20.0
   VMT Mix:  0.621  0.185  0.086          0.038  0.003  0.001  0.061  0.005
0Composite Emission Factors (Gm/Mile)
 VOC    HC:  2.69   3.08   3.45   3.20    3.34   0.72   1.02   2.41   3.98   2.84
 Exhst  CO: 35.13  37.81  41.16  38.87   46.29   1.66   1.91  11.60  34.38  35.00
 Exhst NOX:  2.04   2.23   2.35   2.27    5.59   1.60   1.79  14.18   1.06   2.97
            ----------------------------------------------------------------------
-M111 Error:
+            The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+            The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+            The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M 83 Comment:
+             One or more evaporative temperatures (input daily
              maximum, input ambient, calculated hot soak, and/or
              calculated running loss) is 40F or less, or input
              daily minimum is 25F or less; no evaporative emission
              factors (hot soak, diurnal, running loss, or resting
              loss) will be calculated.
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1994           Region: Low          Altitude:  500. Ft.
                      I/M Program: Yes      Ambient Temp:   31.3 / 31.3 / 31.3 F
                 Anti-tam. Program: No     Operating Mode:  20.6 / 27.3 / 20.6
                  Reformulated Gas: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT    HDGV   LDDV   LDDT   HDDV    MC   All Veh
+           ------ ------ ------ ------  ------ ------ ------ ------ ------ ------
 Veh. Spd.: 25.0   25.0   25.0           25.0   25.0   25.0   25.0   25.0
   VMT Mix:  0.621  0.185  0.086          0.038  0.003  0.001  0.061  0.005
0Composite Emission Factors (Gm/Mile)
 VOC    HC:  2.24   2.59   2.91   2.69    2.49   0.60   0.86   2.02   3.41   2.36
 Exhst  CO: 28.89  31.03  33.87  31.93   36.32   1.31   1.51   9.17  27.41  28.68
 Exhst NOX:  2.09   2.28   2.41   2.32    5.83   1.47   1.65  13.09   1.17   2.96
            ----------------------------------------------------------------------
-M111 Error:
+            The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+            The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+            The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M 83 Comment:
+             One or more evaporative temperatures (input daily
              maximum, input ambient, calculated hot soak, and/or
              calculated running loss) is 40F or less, or input
              daily minimum is 25F or less; no evaporative emission
              factors (hot soak, diurnal, running loss, or resting
              loss) will be calculated.
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1994           Region: Low          Altitude:  500. Ft.
                      I/M Program: Yes      Ambient Temp:   31.3 / 31.3 / 31.3 F
                 Anti-tam. Program: No     Operating Mode:  20.6 / 27.3 / 20.6
                  Reformulated Gas: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT    HDGV   LDDV   LDDT   HDDV    MC   All Veh
+           ------ ------ ------ ------  ------ ------ ------ ------ ------ ------
 Veh. Spd.: 30.0   30.0   30.0           30.0   30.0   30.0   30.0   30.0
   VMT Mix:  0.621  0.185  0.086          0.038  0.003  0.001  0.061  0.005
0Composite Emission Factors (Gm/Mile)
 VOC    HC:  1.94   2.26   2.53   2.35    1.94   0.52   0.74   1.73   2.99   2.04
 Exhst  CO: 24.70  26.44  28.97  27.24   30.11   1.09   1.25   7.58  22.37  24.45
 Exhst NOX:  2.13   2.32   2.45   2.36    6.08   1.41   1.58  12.51   1.27   2.96
            ----------------------------------------------------------------------
-M111 Error:
+            The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+            The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+            The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M 83 Comment:
+             One or more evaporative temperatures (input daily
```

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               maximum, input ambient, calculated hot soak, and/or
               calculated running loss) is 40F or less, or input
               daily minimum is 25F or less; no evaporative emission
               factors (hot soak, diurnal, running loss, or resting
               loss) will be calculated.
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1994             Region: Low           Altitude:  500. Ft.
                    I/M Program: Yes       Ambient Temp:   31.3 / 31.3 / 31.3 F
               Anti-tam. Program: No      Operating Mode:   20.6 / 27.3 / 20.6
                Reformulated Gas: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT    HDGV   LDDV   LDDT   HDDV    MC   All Veh
+           _____ ______ ______ ______  ______ ______ ______ ______ ______ _______
 Veh. Spd.: 35.0   35.0   35.0           35.0   35.0   35.0   35.0   35.0
   VMT Mix:  0.621  0.185  0.086          0.038  0.003  0.001  0.061  0.005
0Composite Emission Factors (Gm/Mile)
 VOC    HC:  1.72   2.02   2.27   2.10    1.58   0.45   0.64   1.52   2.65    1.81
 Exhst  CO: 21.71  23.15  25.46  23.88   26.37   0.94   1.08   6.56  18.64   21.46
 Exhst NOX:  2.16   2.34   2.48   2.39    6.32   1.40   1.57  12.40   1.35    2.99
 _________________________________________________________________________________
-M111 Error:
+              The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+              The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+              The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M 83 Comment:
+              One or more evaporative temperatures (input daily
               maximum, input ambient, calculated hot soak, and/or
               calculated running loss) is 40F or less, or input
               daily minimum is 25F or less; no evaporative emission
               factors (hot soak, diurnal, running loss, or resting
               loss) will be calculated.
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1994             Region: Low           Altitude:  500. Ft.
                    I/M Program: Yes       Ambient Temp:   31.3 / 31.3 / 31.3 F
               Anti-tam. Program: No      Operating Mode:   20.6 / 27.3 / 20.6
                Reformulated Gas: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT    HDGV   LDDV   LDDT   HDDV    MC   All Veh
+           _____ ______ ______ ______  ______ ______ ______ ______ ______ _______
 Veh. Spd.: 40.0   40.0   40.0           40.0   40.0   40.0   40.0   40.0
   VMT Mix:  0.621  0.185  0.086          0.038  0.003  0.001  0.061  0.005
0Composite Emission Factors (Gm/Mile)
 VOC    HC:  1.56   1.85   2.07   1.92    1.34   0.40   0.58   1.36   2.42    1.64
 Exhst  CO: 19.47  20.71  22.86  21.39   24.41   0.85   0.98   5.95  16.04   19.27
 Exhst NOX:  2.18   2.36   2.50   2.41    6.57   1.43   1.61  12.73   1.40    3.04
 _________________________________________________________________________________
-M111 Error:
+              The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+              The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+              The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M 83 Comment:
+              One or more evaporative temperatures (input daily
               maximum, input ambient, calculated hot soak, and/or
               calculated running loss) is 40F or less, or input
               daily minimum is 25F or less; no evaporative emission
               factors (hot soak, diurnal, running loss, or resting
               loss) will be calculated.
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1994             Region: Low           Altitude:  500. Ft.
                    I/M Program: Yes       Ambient Temp:   31.3 / 31.3 / 31.3 F
               Anti-tam. Program: No      Operating Mode:   20.6 / 27.3 / 20.6
                Reformulated Gas: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT    HDGV   LDDV   LDDT   HDDV    MC   All Veh
+           _____ ______ ______ ______  ______ ______ ______ ______ ______ _______
 Veh. Spd.: 45.0   45.0   45.0           45.0   45.0   45.0   45.0   45.0
   VMT Mix:  0.621  0.185  0.086          0.038  0.003  0.001  0.061  0.005
0Composite Emission Factors (Gm/Mile)
 VOC    HC:  1.44   1.71   1.92   1.78    1.18   0.37   0.53   1.24   2.29    1.51
 Exhst  CO: 17.76  18.88  20.88  19.52   23.86   0.81   0.93   5.64  14.41   17.65
 Exhst NOX:  2.20   2.38   2.52   2.43    6.81   1.52   1.71  13.54   1.44    3.12
 _________________________________________________________________________________
-M111 Error:
+              The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+              The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
```

-M111 Error:
+ The calculated exhaust temperature 31.3 is < daily min temp or > daily max temp
-M 83 Comment:
+ One or more evaporative temperatures (input daily maximum, input ambient, calculated hot soak, and/or calculated running loss) is 40F or less, or input daily minimum is 25F or less; no evaporative emission factors (hot soak, diurnal, running loss, or resting loss) will be calculated.

0Emission factors are as of Jan. 1st of the indicated calendar year.

0User supplied veh registration distributions.

0Cal. Year: 1994 Region: Low Altitude: 500. Ft.
I/M Program: Yes Ambient Temp: 31.3 / 31.3 / 31.3 F
Anti-tam. Program: No Operating Mode: 20.6 / 27.3 / 20.6
Reformulated Gas: No

0Veh. Type:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
Veh. Spd.:	50.0	50.0	50.0		50.0	50.0	50.0	50.0	50.0	
VMT Mix:	0.621	0.185	0.086		0.038	0.003	0.001	0.061	0.005	
0Composite Emission Factors (Gm/Mile)										
VOC HC:	1.38	1.65	1.84	1.71	1.08	0.35	0.49	1.17	2.25	1.44
Exhst CO:	16.92	17.99	19.91	18.60	24.65	0.80	0.92	5.59	13.74	16.90
Exhst NOX:	2.38	2.58	2.74	2.63	7.06	1.68	1.89	14.92	1.57	3.38

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16778-202   NEW ENGLAND BAPTIST Microscale 1998  3/8/94                    0000000
 MOBILE5a (26-Mar-93)
0
-M 49 Warning:
+               1.00      MYR sum not = 1. (will normalize)
-M 49 Warning:
+               1.00      MYR sum not = 1. (will normalize)
-M111 Error:
+             The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+             The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+             The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M 83 Comment:
+              One or more evaporative temperatures (input daily
               maximum, input ambient, calculated hot soak, and/or
               calculated running loss) is 40F or less, or input
               daily minimum is 25F or less; no evaporative emission
               factors (hot soak, diurnal, running loss, or resting
               loss) will be calculated.
0I/M program selected:

0     Start year (January 1):              1983
      Pre-1981 MYR stringency rate:         12%
      First model year covered:            1984
      Last model year covered:             2020
      Waiver rate (pre-1981):               1.%
      Waiver rate (1981 and newer):         1.%
      Compliance Rate:                     85.%
      Inspection type:                     Computerized Test and Repair
      Inspection frequency                 Annual
      Vehicle types covered:               LDGV - Yes
                                          LDGT1 - Yes
                                          LDGT2 - Yes
                                           HDGV - No
      1981 & later MYR test type:          Idle
      Cutpoints, HC:  220.000   CO:    1.200   NOx:  999.000
0Stage II program selected:

0     Start year (January 1):              1991
      Phase-in period (yrs.):                 3
      Percent Efficiency for LDGV & LDGT: 95.%
      Percent Efficiency for HDGV:         95.%

01998  NEB MICRO
                         Minimum Temp: 29. (F)   Maximum Temp: 30. (F)
                         Period 1 RVP: 13.5      Period 2 RVP: 13.5 Period 2 Yr: 1989
0VOC HC emission factors include evaporative HC emission factors.
0____________________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1998            Region: Low          Altitude:  500. Ft.
                        I/M Program: Yes       Ambient Temp:   31.3 / 31.3 / 31.3 F
                   Anti-tam. Program: No     Operating Mode:   20.6 / 27.3 / 20.6
                    Reformulated Gas: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT    HDGV   LDDV   LDDT   HDDV   MC   All Veh
+           _____  _____  _____  _____   _____  _____  _____  _____  _____  _____
 Veh. Spd.:  2.5    2.5    2.5            2.5    2.5    2.5    2.5    2.5
   VMT Mix: 0.606  0.195  0.087          0.039  0.001  0.001  0.067  0.005
0Composite Emission Factors (Gm/Mile)
 VOC    HC: 11.90  13.65  16.12  14.42  10.84   1.40   1.84   4.90  18.18  12.11
 Exhst  CO:157.15 167.51 193.57 175.58 125.36   5.10   5.55  36.18 254.46 153.20
 Exhst NOX:  2.71   2.92   3.36   3.05   4.09   2.35   2.56  17.83   1.17   3.86
 ____________________________________________________________________________________
-M111 Error:
+             The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+             The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+             The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M 83 Comment:
+              One or more evaporative temperatures (input daily
               maximum, input ambient, calculated hot soak, and/or
               calculated running loss) is 40F or less, or input
               daily minimum is 25F or less; no evaporative emission
               factors (hot soak, diurnal, running loss, or resting
               loss) will be calculated.
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1998            Region: Low          Altitude:  500. Ft.
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              I/M Program: Yes      Ambient Temp:   31.3 / 31.3 / 31.3 F
        Anti-tam. Program: No     Operating Mode:   20.6 / 27.3 / 20.6
         Reformulated Gas: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV    MC   All Veh
+           _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
 Veh. Spd.:  5.0    5.0    5.0           5.0    5.0    5.0    5.0    5.0
   VMT Mix: 0.606  0.195  0.087         0.039  0.001  0.001  0.067  0.005
0Composite Emission Factors (Gm/Mile)
 VOC    HC:  6.49   7.44   8.76   7.85   8.65   1.23   1.62   4.30  11.33   6.82
 Exhst  CO: 85.99  92.68 106.35  96.92 100.16   4.17   4.53  29.53 146.59  85.97
 Exhst NOX:  2.19   2.36   2.72   2.47   4.20   2.11   2.30  16.03   1.05   3.27
 _______________________________________________________________________________
-M111 Error:
+            The calculated exhaust     temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+            The calculated exhaust     temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+            The calculated exhaust     temperature  31.3 is < daily min temp or > daily max temp
-M 83 Comment:
+             One or more evaporative temperatures (input daily
              maximum, input ambient, calculated hot soak, and/or
              calculated running loss) is 40F or less, or input
              daily minimum is 25F or less; no evaporative emission
              factors (hot soak, diurnal, running loss, or resting
              loss) will be calculated.
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1998          Region: Low          Altitude:  500. Ft.
              I/M Program: Yes      Ambient Temp:   31.3 / 31.3 / 31.3 F
        Anti-tam. Program: No     Operating Mode:   20.6 / 27.3 / 20.6
         Reformulated Gas: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV    MC   All Veh
+           _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
 Veh. Spd.: 10.0   10.0   10.0          10.0   10.0   10.0   10.0   10.0
   VMT Mix: 0.606  0.195  0.087         0.039  0.001  0.001  0.067  0.005
0Composite Emission Factors (Gm/Mile)
 VOC    HC:  3.76   4.30   5.02   4.52   5.69   0.97   1.27   3.38   6.13   4.03
 Exhst  CO: 50.18  54.98  61.94  57.14  66.64   2.87   3.12  20.36  70.42  50.79
 Exhst NOX:  1.93   2.08   2.41   2.18   4.41   1.75   1.91  13.30   0.95   2.85
 _______________________________________________________________________________
-M111 Error:
+            The calculated exhaust     temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+            The calculated exhaust     temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+            The calculated exhaust     temperature  31.3 is < daily min temp or > daily max temp
-M 83 Comment:
+             One or more evaporative temperatures (input daily
              maximum, input ambient, calculated hot soak, and/or
              calculated running loss) is 40F or less, or input
              daily minimum is 25F or less; no evaporative emission
              factors (hot soak, diurnal, running loss, or resting
              loss) will be calculated.
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1998          Region: Low          Altitude:  500. Ft.
              I/M Program: Yes      Ambient Temp:   31.3 / 31.3 / 31.3 F
        Anti-tam. Program: No     Operating Mode:   20.6 / 27.3 / 20.6
         Reformulated Gas: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV    MC   All Veh
+           _____  _____  _____  _____  _____  _____  _____  _____  _____  _____
 Veh. Spd.: 15.0   15.0   15.0          15.0   15.0   15.0   15.0   15.0
   VMT Mix: 0.606  0.195  0.087         0.039  0.001  0.001  0.067  0.005
0Composite Emission Factors (Gm/Mile)
 VOC    HC:  2.85   3.25   3.77   3.41   3.90   0.78   1.02   2.71   4.35   3.04
 Exhst  CO: 38.28  42.48  47.23  43.95  46.84   2.07   2.25  14.69  45.74  38.60
 Exhst NOX:  1.85   1.99   2.30   2.08   4.63   1.50   1.64  11.43   0.97   2.66
 _______________________________________________________________________________
-M111 Error:
+            The calculated exhaust     temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+            The calculated exhaust     temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+            The calculated exhaust     temperature  31.3 is < daily min temp or > daily max temp
-M 83 Comment:
+             One or more evaporative temperatures (input daily
              maximum, input ambient, calculated hot soak, and/or
              calculated running loss) is 40F or less, or input
              daily minimum is 25F or less; no evaporative emission
              factors (hot soak, diurnal, running loss, or resting
```

```
             loss) will be calculated.
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1998          Region: Low           Altitude:  500. Ft.
                  I/M Program: Yes        Ambient Temp:   31.3 / 31.3 / 31.3 F
              Anti-tam. Program: No      Operating Mode:   20.6 / 27.3 / 20.6
               Reformulated Gas: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV   MC   All Veh
+           ______ ______ ______ ______ ______ ______ ______ ______ ______ ______
 Veh. Spd.: 20.0   20.0   20.0          20.0   20.0   20.0   20.0   20.0
   VMT Mix:  0.606  0.195  0.087          0.039  0.001  0.001  0.067  0.005
0Composite Emission Factors (Gm/Mile)
 VOC    HC:  2.37   2.71   3.14   2.84   2.80   0.64   0.84   2.22   3.54   2.52
 Exhst  CO: 31.94  35.88  39.60  37.03  34.79   1.57   1.70  11.10  34.38  32.05
 Exhst NOX:  1.81   1.94   2.25   2.04   4.84   1.34   1.46  10.18   1.06   2.55
 ______________________________________________________________________________
-M111 Error:
+            The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+            The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+            The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M 83 Comment:
+             One or more evaporative temperatures (input daily
              maximum, input ambient, calculated hot soak, and/or
              calculated running loss) is 40F or less, or input
              daily minimum is 25F or less; no evaporative emission
              factors (hot soak, diurnal, running loss, or resting
              loss) will be calculated.
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1998          Region: Low           Altitude:  500. Ft.
                  I/M Program: Yes        Ambient Temp:   31.3 / 31.3 / 31.3 F
              Anti-tam. Program: No      Operating Mode:   20.6 / 27.3 / 20.6
               Reformulated Gas: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV   MC   All Veh
+           ______ ______ ______ ______ ______ ______ ______ ______ ______ ______
 Veh. Spd.: 25.0   25.0   25.0          25.0   25.0   25.0   25.0   25.0
   VMT Mix:  0.606  0.195  0.087          0.039  0.001  0.001  0.067  0.005
0Composite Emission Factors (Gm/Mile)
 VOC    HC:  1.95   2.26   2.62   2.37   2.09   0.53   0.70   1.86   3.03   2.07
 Exhst  CO: 25.19  28.58  31.68  29.54  27.30   1.24   1.35   8.77  27.41  25.37
 Exhst NOX:  1.86   1.97   2.28   2.06   5.05   1.24   1.35   9.40   1.17   2.54
 ______________________________________________________________________________
-M111 Error:
+            The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+            The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+            The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M 83 Comment:
+             One or more evaporative temperatures (input daily
              maximum, input ambient, calculated hot soak, and/or
              calculated running loss) is 40F or less, or input
              daily minimum is 25F or less; no evaporative emission
              factors (hot soak, diurnal, running loss, or resting
              loss) will be calculated.
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1998          Region: Low           Altitude:  500. Ft.
                  I/M Program: Yes        Ambient Temp:   31.3 / 31.3 / 31.3 F
              Anti-tam. Program: No      Operating Mode:   20.6 / 27.3 / 20.6
               Reformulated Gas: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV   MC   All Veh
+           ______ ______ ______ ______ ______ ______ ______ ______ ______ ______
 Veh. Spd.: 30.0   30.0   30.0          30.0   30.0   30.0   30.0   30.0
   VMT Mix:  0.606  0.195  0.087          0.039  0.001  0.001  0.067  0.005
0Composite Emission Factors (Gm/Mile)
 VOC    HC:  1.67   1.96   2.27   2.06   1.63   0.46   0.60   1.60   2.65   1.78
 Exhst  CO: 20.68  23.68  26.38  24.52  22.63   1.02   1.11   7.25  22.37  20.91
 Exhst NOX:  1.89   1.98   2.30   2.08   5.27   1.18   1.29   8.99   1.27   2.55
 ______________________________________________________________________________
-M111 Error:
+            The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+            The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+            The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M 83 Comment:
+             One or more evaporative temperatures (input daily
```

```
             maximum, input ambient, calculated hot soak, and/or
             calculated running loss) is 40F or less, or input
             daily minimum is 25F or less; no evaporative emission
             factors (hot soak, diurnal, running loss, or resting
             loss) will be calculated.
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1998          Region: Low          Altitude:  500. Ft.
               I/M Program: Yes        Ambient Temp:   31.3 / 31.3 / 31.3 F
            Anti-tam. Program: No      Operating Mode:   20.6 / 27.3 / 20.6
             Reformulated Gas: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV    MC   All Veh
+           ------ ------ ------ ------ ------ ------ ------ ------ ------ ------
 Veh. Spd.: 35.0   35.0   35.0          35.0   35.0   35.0   35.0   35.0
   VMT Mix:  0.606  0.195  0.087         0.039  0.001  0.001  0.067  0.005
0Composite Emission Factors (Gm/Mile)
 VOC    HC:  1.47   1.75   2.02   1.83   1.33   0.40   0.53   1.40   2.36   1.56
 Exhst  CO: 17.45  20.18  22.59  20.92  19.82   0.89   0.96   6.28  18.64  17.75
 Exhst NOX:  1.92   2.00   2.32   2.10   5.48   1.17   1.28   8.90   1.35   2.57
----------------------------------------------------------------------------------
-M111 Error:
+           The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+           The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+           The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M 83 Comment:
+            One or more evaporative temperatures (input daily
             maximum, input ambient, calculated hot soak, and/or
             calculated running loss) is 40F or less, or input
             daily minimum is 25F or less; no evaporative emission
             factors (hot soak, diurnal, running loss, or resting
             loss) will be calculated.
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1998          Region: Low          Altitude:  500. Ft.
               I/M Program: Yes        Ambient Temp:   31.3 / 31.3 / 31.3 F
            Anti-tam. Program: No      Operating Mode:   20.6 / 27.3 / 20.6
             Reformulated Gas: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV    MC   All Veh
+           ------ ------ ------ ------ ------ ------ ------ ------ ------ ------
 Veh. Spd.: 40.0   40.0   40.0          40.0   40.0   40.0   40.0   40.0
   VMT Mix:  0.606  0.195  0.087         0.039  0.001  0.001  0.067  0.005
0Composite Emission Factors (Gm/Mile)
 VOC    HC:  1.32   1.59   1.84   1.66   1.12   0.36   0.47   1.26   2.15   1.40
 Exhst  CO: 15.04  17.57  19.76  18.25  18.34   0.80   0.87   5.69  16.04  15.42
 Exhst NOX:  1.94   2.01   2.33   2.11   5.69   1.20   1.31   9.14   1.40   2.61
----------------------------------------------------------------------------------
-M111 Error:
+           The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+           The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+           The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M 83 Comment:
+            One or more evaporative temperatures (input daily
             maximum, input ambient, calculated hot soak, and/or
             calculated running loss) is 40F or less, or input
             daily minimum is 25F or less; no evaporative emission
             factors (hot soak, diurnal, running loss, or resting
             loss) will be calculated.
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1998          Region: Low          Altitude:  500. Ft.
               I/M Program: Yes        Ambient Temp:   31.3 / 31.3 / 31.3 F
            Anti-tam. Program: No      Operating Mode:   20.6 / 27.3 / 20.6
             Reformulated Gas: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV    MC   All Veh
+           ------ ------ ------ ------ ------ ------ ------ ------ ------ ------
 Veh. Spd.: 45.0   45.0   45.0          45.0   45.0   45.0   45.0   45.0
   VMT Mix:  0.606  0.195  0.087         0.039  0.001  0.001  0.067  0.005
0Composite Emission Factors (Gm/Mile)
 VOC    HC:  1.20   1.46   1.69   1.53   0.99   0.33   0.43   1.15   2.03   1.28
 Exhst  CO: 13.17  15.56  17.58  16.18  17.94   0.76   0.83   5.39  14.41  13.67
 Exhst NOX:  1.95   2.01   2.34   2.12   5.90   1.28   1.40   9.72   1.44   2.67
----------------------------------------------------------------------------------
-M111 Error:
+           The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M111 Error:
+           The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
```

```
-M111 Error:
+            The calculated exhaust      temperature  31.3 is < daily min temp or > daily max temp
-M 83 Comment:
+             One or more evaporative temperatures (input daily
              maximum, input ambient, calculated hot soak, and/or
              calculated running loss) is 40F or less, or input
              daily minimum is 25F or less; no evaporative emission
              factors (hot soak, diurnal, running loss, or resting
              loss) will be calculated.
0Emission factors are as of Jan. 1st of the indicated calendar year.
0User supplied veh registration distributions.
0Cal. Year: 1998           Region: Low          Altitude:  500. Ft.
                      I/M Program: Yes      Ambient Temp:   31.3 / 31.3 / 31.3 F
                 Anti-tam. Program: No     Operating Mode:   20.6 / 27.3 / 20.6
                  Reformulated Gas: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT   HDGV   LDDV   LDDT   HDDV   MC   All Veh
+
 Veh. Spd.: 50.0   50.0   50.0           50.0   50.0   50.0   50.0   50.0
   VMT Mix:  0.606  0.195  0.087          0.039  0.001  0.001  0.067  0.005
0Composite Emission Factors (Gm/Mile)
 VOC    HC:  1.14   1.40   1.62   1.47   0.91   0.31   0.40   1.08   1.99   1.22
 Exhst  CO: 12.25  14.56  16.50  15.16  18.53   0.76   0.82   5.35  13.74  12.83
 Exhst NOX:  2.09   2.17   2.53   2.28   6.12   1.41   1.54  10.71   1.57   2.87
```

APPENDIX E

Noise Technical Analysis

APPENDIX E - NOISE TECHNICAL ANALYSIS

E.1 Introduction

Noise control is an inherent consideration in the design of a major urban facility. The noise control designers must analyze all of the potential noise sources at the facility and all of the noise propagation paths between these sources and sensitive locations inside and outside of the facility. Specialized noise control treatment is then designed for each individual noise source identified to have the potential to exceed the project noise standard at sensitive locations. At this time, the Ambulatory Care Building is in the preliminary design stage and detailed acoustic design is not feasible. However, the major potential sources of community noise have been identified.

The noise impact analysis focuses on these major sources, and demonstrates that the proposed design of the facility will not produce excessive noise at the boundaries of the receiving properties. Noise level estimates of individual sources is based on procedures from the acoustic literature. Most current technology units contain internal noise mitigation and tend to produce less noise than the older units on which the procedures are based. Final equipment design may differ from that discussed here but will have the same goal of meeting the applicable noise performance standards.

The purpose of this technical appendix is to provide details on the calculation inputs and methodology.

E.2 Existing Noise Environment

Ambient noise conditions near the facility were established by field survey. Meteorological conditions, based on field observations, were noted during the measurement survey. Measurements were conducted during a weekday daytime period and a weekday nighttime period. These conditions were selected to represent periods of low ambient noise in order to establish a conservative baseline for evaluating noise impacts of the Project construction and operation, respectively. During periods of higher ambient noise, noise from the Project will have less effect on the community. Noise measurement locations and results of the survey are described in Section IV.4 of the DPIR.

A Bruel and Kjaer Type 2231 Sound Level Meter with a Type BZ 7101 Statistical Analysis Module and a Type 4155 half-inch microphone was used for all measurements. The meter meets the requirements of ANSI S1.4-1983 for Type I "Precision" sound level meters. It was field-calibrated before and after the measurements with B&K Type 4230 field acoustic calibrator, meeting the requirements of ANSI S1.40-1984. The meter was mounted five feet above the ground, about the height of the ears of a standing person, during each of the ground level sampling periods. The microphone was equipped with a four inch foam windscreen. Care was taken to avoid taking measurements near large reflective surfaces.

E.3 Operational Noise Evaluation

Since much of the mechanical requirements of the Ambulatory Care Building will be provided by the existing facility, very few additional noise sources are planned. Minor or infrequent sources such as bathroom exhaust fans and emergency generators were not included in this study. Increased chiller capacity is planned to be added to the Hospital for the Project and future needs. Since this equipment will be installed with similar equipment, no modeling of this noise is included in this study. The Parking Structure will be open ventilation and not require mechanical equipment. Noise from the emergency generators will be exhausted to the roof and are not included in this study due to the expected infrequent operation.

The noise modeling receptors were selected at community locations that represented the nearest sensitive location in a general direction from the Project. The horizontal distance modeled from the noise source to each receptor is based on the nearest part of receiving building or property line. Calculations were performed to identify the elevation at the receiving location where the highest project sound levels are expected. Some locations in the community will be shielded from the operational noise by intervening buildings. No credit was taken in this analysis for such shielding effects. Since the equipment noise levels generally decrease with increased distance, the resulting levels at more distant locations are expected to be less than predicted here. The Noise Modeling Locations are shown on Figure E-1.

The analysis provides the expected noise level from individual sources at each receptor as well as the combined noise level of all modeled facility noise sources. Calculation tables are provided in Tables E-1 through E-2. Noise estimates at the residences to the northeast are based on the sound being reflected (perfectly) from the east wall of the Fogg Building. Calculations indicate that more noise can be propagated by this pathway than by bending around the corner of the Ambulatory Care Building. Tables E-3 through E-8 show the summing of individual source contributions to make up the combined facility noise levels at each receptor location.

The elevation and specific location of a receptor depends on the its relationship to the corresponding modeled noise source. The source-receptor pathway is selected which yields the highest estimate of receptor noise level. Generally, this is represented by the shortest distance between the source and receptor. If a source-receptor pathway includes directivity or shielding effects, a comparison is made between the closest location and a more distant location (or elevation) which would have less benefit of the directivity or shielding effects. The geometry that produces the highest resulting level is used to represent the source receptor pathway. The combined level representing each receptor is the composite of the worst case estimates for individual sources. This methodology produces a conservative (actual level at any location should be less) estimate of the combined noise level at each receptor.

Attenuation with distance is calculated as $10\text{Log}[2\pi R^2]$, where R is the distance in meters; minus air absorption for standard atmospheric conditions from Table 5.1 of the Edison Electric Institute's Environmental Noise Guide[1] (EEIG). Some noise sources, such as those at this facility, emit sound energy primarily in one direction. The noise level at the receiving location is based on the angular direction from vertical. Due to the location of the facility on a hill, most receptors are well below the elevation of the sources. Directivity adjustments for these calculations are provided by Table 7-23 of Hoover & Keith[2]. An additional adjustment was added to sources to the west to account for potential reflection of the sound from the brick wall of the facility.

Air Handling Unit Inlets will draw incoming air vertically through an areaway along the west side of the building to the basement location of the equipment. An open grate will form a walkway above the areaway. An

1 Published in 1978 and later revised by Edison Electric Institute, New York (now in Washington, DC), and electrical utility trade group.

2 Noise Control for Buildings, Manufacturing Plants, Equipment and Products, 1991 lecture notes from annual noise control course copyright 1981 by Bolt Beranek and Newman, Inc. transferred to Hoover & Keith Inc. effective 1992, Houston, TX.

estimate of the sound power level of the air inlets were provided by Table 7-13R of Hoover & Keith. The estimate is based on 50,000 cubic feet per minute of air handling capacity. The inlet air will be moved by two separate 60 hp fan/motor units which will typically operate together.

Air Handling exhaust vent will empty into an areaway along the west side of the building that is adjacent to the air inlet areaway. A fan rated at approximately 50 hp will boost the air ejection from the system. This study assumes 20,000 cfm total exhaust fan power. Fan noise, directivity correction and building reflection have been calculated consistent with the air inlet calculations.

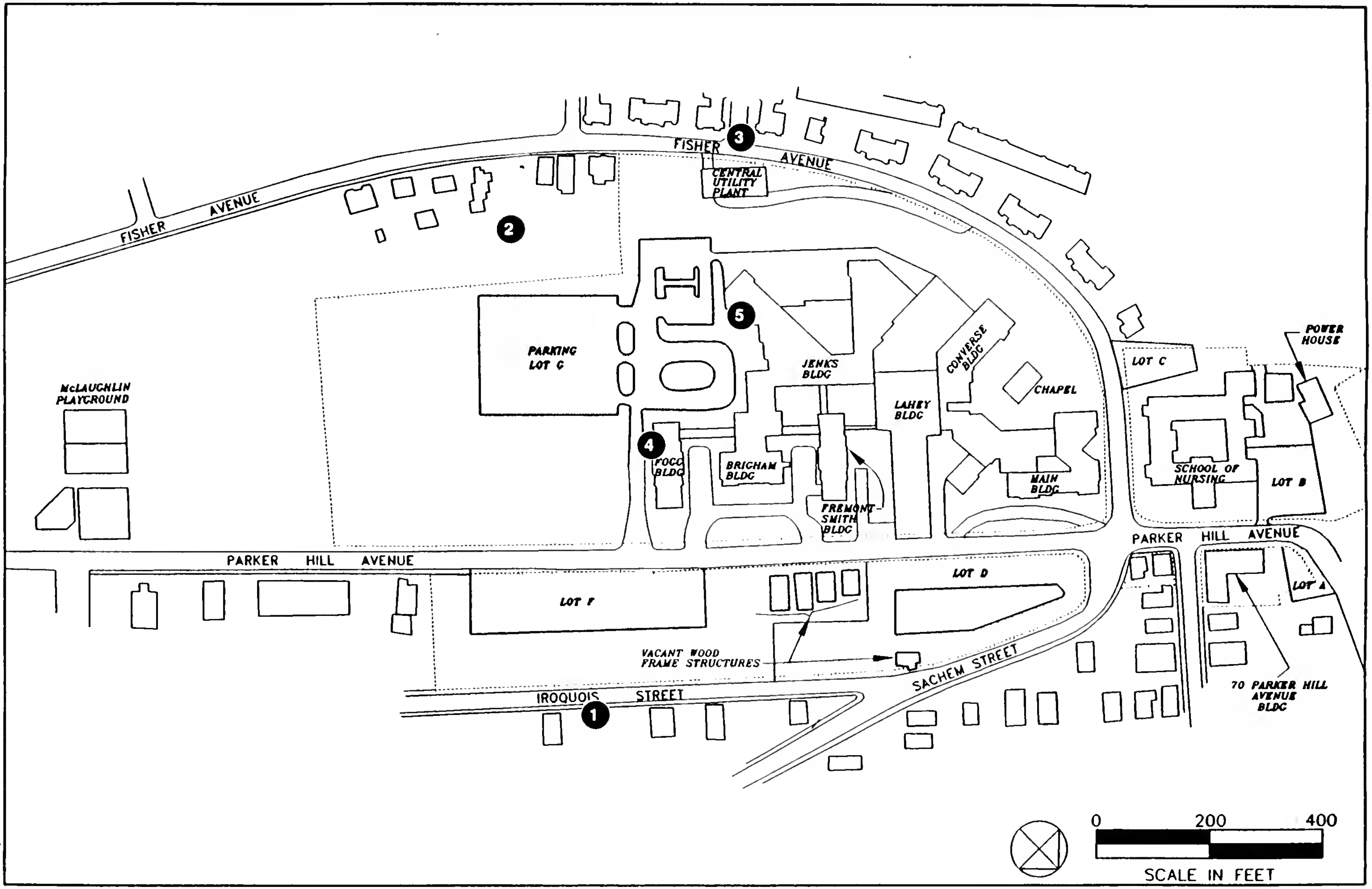


FIGURE E-1
NOISE MODELING LOCATIONS
NEW ENGLAND BAPTIST HOSPITAL

HMM Associates, Inc.
A Summit Company

TABLE E - 1: ESTIMATE OF NOISE FROM THE HVAC INLETS

dB (re 20 microPascals)

Source	A-wtd dBA	overall dB	31.5	63	125	250	500	1000	2000	4000	8000
			Octave Band Center Frequency (Hz)								
1. Air Handler Inlets											
Estimate (based on 70,000 cfm, .25 w.g.)	76	92	87	87	87	77	70	70	65	60	55
from Hoover & Keith Sect. 7.13											
blade passage range								2	2	2	
directivity from vertical areaway (90 degrees)			-2	-3	-4	-6	-8	-10	-12	-14	-16
net PWL	70	89	85	84	83	71	62	62	55	48	39
ATTENUATION w. distance			**North Property Line**								
distance in feet ----->	335						distance in meters ---->			102	
distance loss			-48	-48	-48	-49	-49	-49	-50	-52	-54
Level at Property Line, N	21	41	37	36	35	22	13	13	5	-4	-15
ATTENUATION w. distance			**Northeast Property Line**								
distance in feet ----->	450						distance in meters ---->			137	
distance loss			-51	-51	-51	-51	-52	-52	-53	-55	-59
Level at Property Line, NE	19	38	34	33	32	20	10	10	2	-7	-20
ATTENUATION w. distance			**South Property Line**								
distance in feet ----->	320						distance in meters ---->			98	
distance loss			-48	-48	-48	-48	-48	-49	-49	-51	-53
Level at Property Line, S	22	41	37	36	35	23	14	13	6	-3	-14
ATTENUATION w. distance			**Southwest Property Line**								
distance in feet ----->	520						distance in meters ---->			158	
distance loss			-52	-52	-52	-53	-53	-54	-55	-57	-61
Level at Property Line, SW	17	37	33	32	31	18	9	8	0	-9	-22
ATTENUATION w. distance			**Fogg Building**								
distance in feet ----->	92						distance in meters ---->			28	
distance loss			-37	-37	-37	-37	-37	-37	-37	-38	-39
Reflection from building wall			3	3	3	3	3	3	3	3	3
Remove directivity correction			2	3	4	6	8	10	12	14	16
Level at Fogg Bldg.	43	58	53	53	53	43	36	38	33	27	19
ATTENUATION w. distance			**Jenks Building**								
distance in feet ----->	300						distance in meters ---->			91	
distance loss			-47	-47	-47	-48	-48	-48	-49	-50	-53
Reflection from building wall			3	3	3	3	3	3	3	3	3
Level at Jenks Bldg.	25	45	41	40	39	26	17	17	9	1	-11

TABLE E - 2: ESTIMATE OF NOISE FROM THE HVAC EXHAUST VENT

dB (re 20 microPascals)

Source	A-wtd dBA	overall dB	31.5	63	125	250	500	1000	2000	4000	8000
			Octave Band Center Frequency (Hz)								
2. Air Handler Exhaust Vent											
Estimate (based on 50 hp boost fan only)	73	89	84	84	84	74	67	67	63	57	52
(half the power of the inlet fans)											
blade passage range								2	2	2	
directivity from vertical areaway (90 degrees)			-2	-3	-4	-6	-8	-10	-12	-14	-16
net PWL	67	86	82	81	80	68	59	59	53	45	36
ATTENUATION w. distance			**North Property Line**								
distance in feet ----->	335							distance in meters ---->		102	
distance loss			-48	-48	-48	-49	-49	-49	-50	-52	-54
Level at Property Line, N	18	38	34	33	32	19	10	10	3	-7	-18
ATTENUATION w. distance			**Northeast Property Line**								
distance in feet ----->	450							distance in meters ---->		137	
distance loss			-51	-51	-51	-51	-52	-52	-53	-55	-59
Level at Property Line, NE	16	35	31	30	29	17	7	7	0	-10	-23
ATTENUATION w. distance			**South Property Line**								
distance in feet ----->	320							distance in meters ----->		98	
distance loss			-48	-48	-48	-48	-48	-49	-49	-51	-53
Level at Property Line, S	19	38	34	33	32	20	11	10	4	-6	-17
ATTENUATION w. distance			**Southwest Property Line**								
distance in feet ----->	520							distance in meters ---->		158	
distance loss			-52	-52	-52	-53	-53	-54	-55	-57	-61
Level at Property Line, SW	14	34	30	29	28	15	6	5	-2	-12	-25
ATTENUATION w. distance			**Fogg Building**								
distance in feet ----->	92							distance in meters ---->		28	
distance loss			-37	-37	-37	-37	-37	-37	-37	-38	-39
Reflection from building wall			3	3	3	3	3	3	3	3	3
Remove directivity correction			2	3	4	6	8	10	12	14	16
Level at Fogg Bldg.	40	55	50	50	50	40	33	35	31	24	16
ATTENUATION w. distance			**Jenks Building**								
distance in feet ----->	300							distance in meters ---->		91	
distance loss			-47	-47	-47	-48	-48	-48	-49	-50	-53
Reflection from building wall			3	3	3	3	3	3	3	3	3
Level at Jenks Bldg.	22	42	38	37	36	23	14	14	7	-2	-14

TABLE E-3: COMBINED NOISE LEVELS AT THE NORTH PROPERTY LINE

dB (re 20 microPascals)

Contributing Source	dBA	OA	31.5	63	125	250	500	1000	2000	4000	8000
			Octave Band Center Frequency (Hz)								
1. Air Handler Inlets	21		37	36	35	22	13	13	5	-4	-15
2. Air Handler Exhaust Vent	18		34	33	32	19	10	10	3	-7	-18
COMBINED TOTAL	23	42	39	37	36	24	15	15	7	-2	-13
Residential Zoning Limit	50		68	67	61	52	45	40	33	28	26
DIFFERENCE	-27		-29	-30	-25	-28	-30	-25	-26	-30	-39

TABLE E-4: COMBINED NOISE LEVELS AT RESIDENCES TO THE NORTHEAST

dB (re 20 microPascals)

Contributing Source	dBA	OA	31.5	63	125	250	500	1000	2000	4000	8000
			Octave Band Center Frequency (Hz)								
1. Air Handler Inlets	19		34	33	32	20	10	10	2	-7	-20
2. Air Handler Exhaust Vent	16		31	30	29	17	7	7	0	-10	-23
COMBINED TOTAL	20	40	36	35	34	22	12	12	4	-6	-18
Residential Zoning Limit	50		68	67	61	52	45	40	33	28	26
DIFFERENCE	-30		-32	-32	-27	-30	-33	-28	-29	-34	-44

TABLE E-5: COMBINED NOISE LEVELS AT THE SOUTH PROPERTY LINE

dB (re 20 microPascals)

			Octave Band Center Frequency (Hz)								
Contributing Source	dBA	OA	31.5	63	125	250	500	1000	2000	4000	8000
1. Air Handler Inlets	22		37	36	35	23	14	13	6	-3	-14
2. Air Handler Exhaust Vent	19		34	33	32	20	11	10	4	-6	-17
COMBINED TOTAL	24	43	39	38	37	25	15	15	8	-1	-13
Residential Zoning Limit	50		68	67	61	52	45	40	33	28	26
DIFFERENCE	-26		-29	-29	-24	-27	-30	-25	-25	-29	-39

TABLE E-6: COMBINED NOISE LEVELS AT THE SOUTHWEST PROPERTY LINE

dB (re 20 microPascals)

			Octave Band Center Frequency (Hz)								
Contributing Source	dBA	OA	31.5	63	125	250	500	1000	2000	4000	8000
1. Air Handler Inlets	17		33	32	31	18	9	8	0	-9	-22
2. Air Handler Exhaust Vent	14		30	29	28	15	6	5	-2	-12	-25
COMBINED TOTAL	19	38	35	34	32	20	11	10	2	-8	-20
Residential Zoning Limit	50		68	67	61	52	45	40	33	28	26
DIFFERENCE	-31		-33	-33	-29	-32	-34	-30	-31	-36	-46

TABLE E-7: COMBINED NOISE LEVELS AT THE FOGG BUILDING

dB (re 20 microPascals)

			Octave Band Center Frequency (Hz)									
Contributing Source	dBA	OA	31.5	63	125	250	500	1000	2000	4000	8000
1. Air Handler Inlets	43		53	53	53	43	36	38	33	27	19
2. Air Handler Exhaust Vent	40		50	50	50	40	33	35	31	24	16
COMBINED TOTAL	45	60	55	55	55	45	38	40	35	29	21
Business Zone Limit	65		79	78	73	68	62	56	51	47	44
DIFFERENCE	-20		-24	-23	-18	-23	-24	-16	-16	-18	-23

TABLE E-8: COMBINED NOISE LEVELS AT THE JENKS BUILDING

dB (re 20 microPascals)

			Octave Band Center Frequency (Hz)								
Contributing Source	dBA	OA	31.5	63	125	250	500	1000	2000	4000	8000
1. Air Handler Inlets	25		41	40	39	26	17	17	9	1	-11
2. Air Handler Exhaust Vent	22		38	37	36	23	14	14	7	-2	-14
COMBINED TOTAL	27	46	42	41	40	28	19	19	11	2	-9
Residential Zoning Limit	50		68	67	61	52	45	40	33	28	26
DIFFERENCE	-23		-26	-26	-21	-24	-26	-21	-22	-26	-35

E.3 Construction Noise Evaluation

An evaluation of construction noise levels expected in the project area was conducted. Ambient baseline measurements were established by field measurements and are described in Section IV.4 of the DPIR. The construction noise target of 75 dBA (L_{10}) at the nearest property line or 50 feet (whichever is greater) from the equipment was indicated by this study. The L_{10} level was estimated for each phase of construction, based on the type, number and usage of individual pieces of equipment.

E.3.1 Applicable Noise Regulations

Regulation 3, "Restrictions on Noise Emitted from Construction Sites" of the Regulations for the control of Noise in the City of Boston establishes limits for construction noise. A summary of the regulation is provided in Table E-9. The regulation limits the maximum noise level to 86 dBA. The L10 is limited to 75 dBA. In cases where the ambient L10 is above 70 dBA, project related noise is limited to 5 dBA over the ambient. The highest existing L10 level measured was well below the 70 dBA threshold. The L10 construction noise limit of 75 is therefore used to evaluate project levels. The limits are applied at the lot line of the receiving property. In cases where equipment is operated closer than 50 feet to the applicable lot line, the limits are applied at 50 feet from the equipment. The City of Boston regulations do not apply to impact devices such as pile drivers and jackhammers.

In addition, different maximum limits apply to heavy motor vehicles such as trucks if they have been sold or leased in the City of Boston. The maximum limit for heavy motor vehicles depends upon their date of manufacture and ranges from 88 dBA at 50 feet for very old trucks to 80 dBA at 50 feet for the newest trucks. These truck limits are applicable anywhere in the City, but they may be superseded by 40 CFR 202 for trucks engaged in interstate commerce.

Table E-9: Summary of City of Boston Construction Site Noise Limits
(Extracted from Regulation 3, City of Boston Air Pollution Control Commission, Regulations for the Control of Noise in the City of Boston, Adopted December 17, 1976)

NOISE LEVEL LIMITS

Land Use of Affected Property	Noise Level Limit (dBA)	
	L10 level	Maximum Noise Level
Residential or Institutional	75	86
Business or Recreational	80	--
Industrial	85	--

- Measured at the lot line of the affected property.
- The industrial noise limit shall apply to public ways.
- The maximum noise level shall be measured with the sound level meter on "SLOW" response.

EXCEPTIONS

- Measurements should not be taken closer than 50 feet from the nearest active construction device on the site.
- The L10 must exceed the ambient L10 by at least 5 dBA to be considered a violation of the limit.

EXCLUSIONS

- The above limits are not applicable to impact devices such as jackhammers, pile drivers, riveters, pavement breakers, etc.

E.3.2 Construction Noise Estimates

Construction of the Project will be limited to daytime periods as much as possible, defined by the Boston Noise Regulation as between 7 a.m. and 6 p.m. except Sunday. Nighttime construction will only be accomplished if required to assure safety or structural integrity. Any exceptional work schedule will be coordinated with the City of Boston, Department of the Environment per ordinance requirement.

The following analysis shows that the noise limits of Boston's Regulation 3 are likely to be met by equipment on the site performing construction activities. It is assumed that heavy trucks and concrete mixers serving the site from the public ways will comply with Boston's Regulation 4, or with 40 CFR 202 as applicable.

The City of Boston construction noise regulations are applied at the receiving lot line or 50 feet, which ever is farther. Since the site is several hundred feet from most receptor locations, most items of equipment will be operating further than 50 feet from a property line. Noise levels decrease with distance, so the 50 foot distance represents the most restrictive application of the limit. All construction equipment estimates in this study are analyzed at a distance of 50 feet. A list of expected construction noise sources is shown, by construction phase, in Table E-9.

The maximum noise levels typically produced by each of the major items of equipment listed above are shown in Table E-10. The maximum noise level of each piece of equipment is below 85 dBA. For the following reasons, the max level is generally dominated by one or a few pieces of equipment which are closest to the receiver. Because almost all construction equipment operates intermittently, some will not be on the Site throughout the construction process, and some will be further than fifty feet from the lot line. Equipment is sometimes unenergized but kept on-site for use when necessary. Even when operating, much construction equipment may be idling or otherwise not producing its highest noise levels.

A procedure for estimating L10 noise levels from construction sites is given by Bolt Beranek and Newman, Power Plant Construction Noise Guide, Report 3321, May, 1977. It starts with the maximum noise level from each item of equipment on the site during a specific construction phase. These levels are adjusted by "usage factors" for the percentage of time that each item of equipment is typically active during the phase, and by "max factors" representing the percentage of time that an item of equipment typically

Table E - 9: Major Noise Sources Anticipated During Construction by Construction Phase

Phase	Description	Equipment
Phase 1	Demolition/Site Preparation	jackhammers (*exempt) 1 air compressor 1 concrete saw 1 back hoe 1 front-end loader trucks
Phase 2	Excavation/Foundation	jackhammers (*exempt) 1 large crane 1 air compressor 1 concrete pump 1 front-end loader 1 pile driver (exempt) concrete trucks trucks
Phase 3	Building Frame Construction	2 large cranes 1 air compressor 2 welders trucks
Phase 4	Building Construction/Curtain Wall	2 large cranes 1 concrete pump 1 front-end loader 1 fork lift 1 air compressor concrete trucks trucks
Phase 5	Building Finishing	1 large crane 1 fork lift 1 air compressor trucks

TABLE E - 10: Estimate of Combined Maximum Noise Levels of Construction Equipment (at 50 feet)

Equipment	Max Level dBA @ 50 ft	Data source (Below)
Large cranes (20 ton)	82	3
Air compressor (125 HP)	81	3
Concrete saw	78	1
Back hoe	83	3
Front-end loader	84	3
Fork lift	< 80	4
Generators / Welders (50 kw)	79	3
Concrete pump (150 cy/h)	81	3
Mortar mixer	80	1
Pile driver ? (exempt)	101	1

DATA SOURCES:

1. USEPA, Noise From Construction Equipment and Operations, Building Equipment, and Home Appliances, NTID300.1, December, 1971.

2. Bolt Beranek and Newman, Power Plant Construction Noise Guide, Report 3321, May 1977.

3. Hoover & Keith Inc., Noise Control for Buildings, Equipment and Products, fourth printing, 1991

4. Estimated: no data found in the literature. This suggests that these have not been found to be major construction noise sources.

produces its maximum noise level when active. The result is an equivalent noise level for each item of equipment. These can be summed for all equipment in use during a construction phase to obtain the equivalent level for that phase. The results of this procedure is shown in Tables E-11 for the construction phases of the proposed Project.

G.4 Conclusions

The noise levels from the operation of construction equipment is highly variable. The City of Boston Noise Regulation limits the maximum noise levels from regulated construction equipment to 86 dBA. Based on maximum noise levels of individual pieces of operating equipment, the resulting levels are expected to be 84 or below and in compliance with the maximum level limit.

The estimates in Tables E-11 indicate that the total equivalent noise levels will be 73 dBA or less for each construction phase. It is therefore estimated that the 75 dBA limit established by Boston's Noise Regulation will be complied with.

Table E -11: Estimates of Combined Leq Levels During Construction By Phase (at 50 feet)

Phase 1 - Demolition/Site Preparation

Noise source	Max. level	*Usage factor	**Max. factor	***No. of items	Total
jackhammers (exempt)	(exempt)	n/a	n/a	n/a	n/a
air compressor	81 dBA	-6 dBA	-7 dBA	1	68 dBA
concrete saw	78	-6	-6	1	66
back hoe	83	-10	-4	1	69
front-end loader	84	-10	-5	2	72
			TOTAL FOR PHASE		75 dBA

Phase 2 - Foundations/Parking Structure

Noise source	Max. level	*Usage factor	**Max. factor	***No. of items	Total
jackhammers (exempt)	(exempt)	n/a	n/a	n/a	n/a
piledrivers (exempt)	(exempt)	n/a	n/a	n/a	n/a
large cranes	82 dBA	-10 dBA	-13 dBA	2	62 dBA
concrete pump	81	-10	-7	1	64
front-end loader	84	-10	-5	2	72
			TOTAL FOR PHASE		73 dBA

Phase 3 - Building Frame Construction

Noise source	Max. level	*Usage factor	**Max. factor	***No. of items	Total
large crane	82 dBA	-10 dBA	-13 dBA	2	62 dBA
welders	79	-6	-7	2	69
air compressor	81	-6	-7	1	68
			TOTAL FOR PHASE		72 dBA

Phase 4 - Building Construction/Curtain Wall

Noise source	Max. level	*Usage factor	**Max. factor	***No. of items	Total
large cranes	82 dBA	-10 dBA	-13 dBA	2	62 dBA
fork lift	80	-10	-6	1	64
concrete pump	81	-10	-7	1	64
front-end loader	84	-10	-5	1	69
air compressor	81	-6	-7	1	68
			TOTAL FOR PHASE		73 dBA

Phase 5 - Building Finishing

Noise source	Max. level	*Usage factor	**Max. factor	***No. of items	Total
large crane	81 dBA	-10 dBA	-13 dBA	1	58 dBA
fork lift	80	-10	-6	1	64
air compressor	81	-6	-7	1	68
			TOTAL FOR PHASE		70 dBA

Notes:

* Estimated, with assistance from Tables A-1 and A-2 of USEPA, Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances, NTID300.1, December, 1971.

** From Table B.5 of Bolt Beranek and Newman, Power Plant Construction Noise Guide, Report 3323, May, 1977. Some values, not given in this source, are estimated.

*** Adustment is 10 Log [number of items]

APPENDIX F

1984 - 1985 Geotechnical Analysis

APPENDIX F - 1984-1985 GEOTECHNICAL ANALYSIS

The following data are the results of a geotechnical test boring program New England Baptist Hospital undertook as part of a 1984-1985 parking garage feasibility study completed by Haley and Aldrich, Inc. The attached information includes the following:

- Figures 1 through 5: Project locus; Test Boring Location Plan; Soils Profiles A, B, and C
- Logs of test borings
- Results of Laboratory grain size testing

HALEY & ALDRICH, INC.
CAMBRIDGE, MASSACHUSETTS

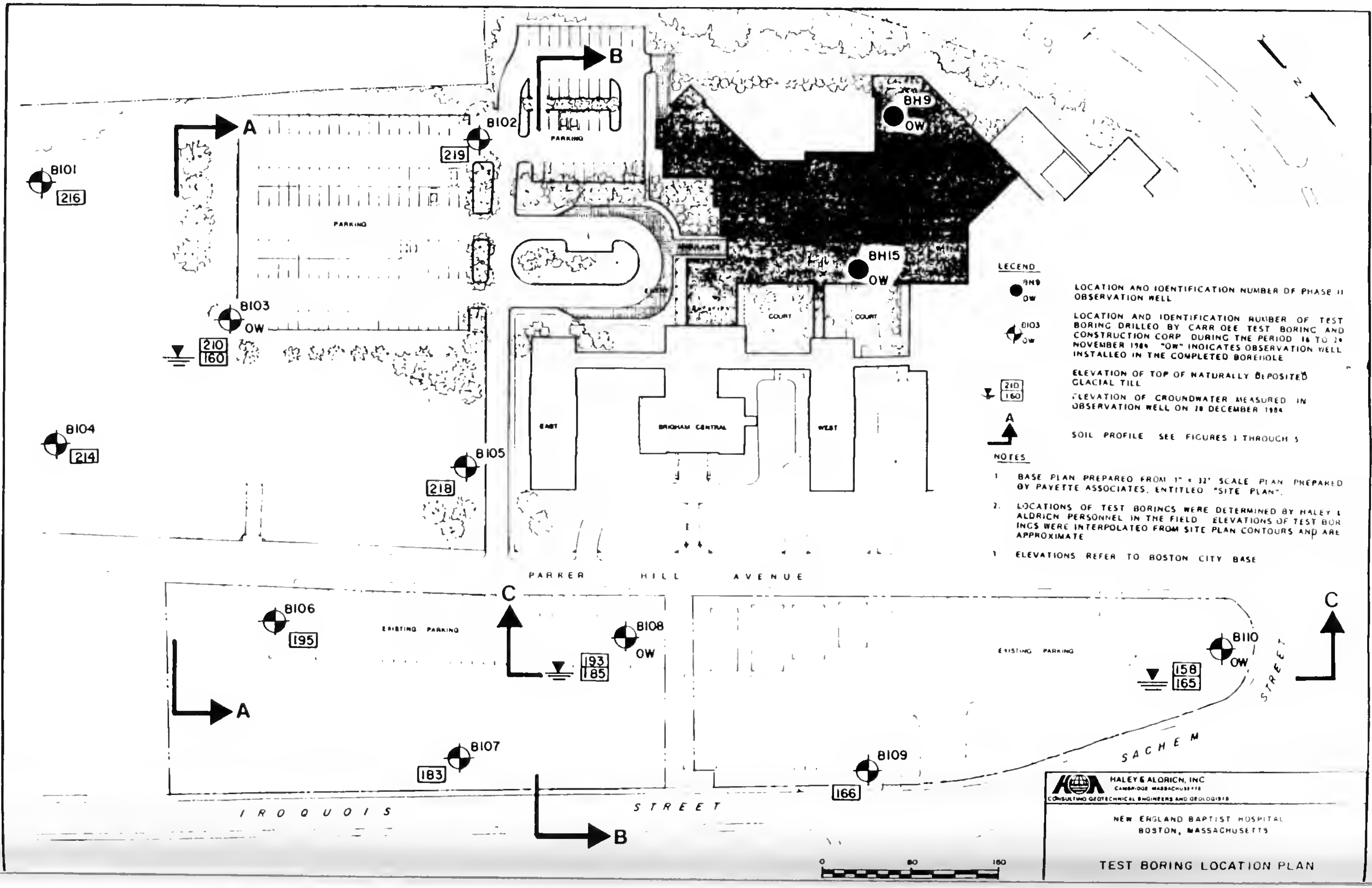
N

PROJECT LOCUS

U.S.G.S. QUADRANGLE
BOSTON SOUTH, MA
APPROXIMATE SCALE 1:25,000

FILE NO. 4612 10 A1

FIGURE 1



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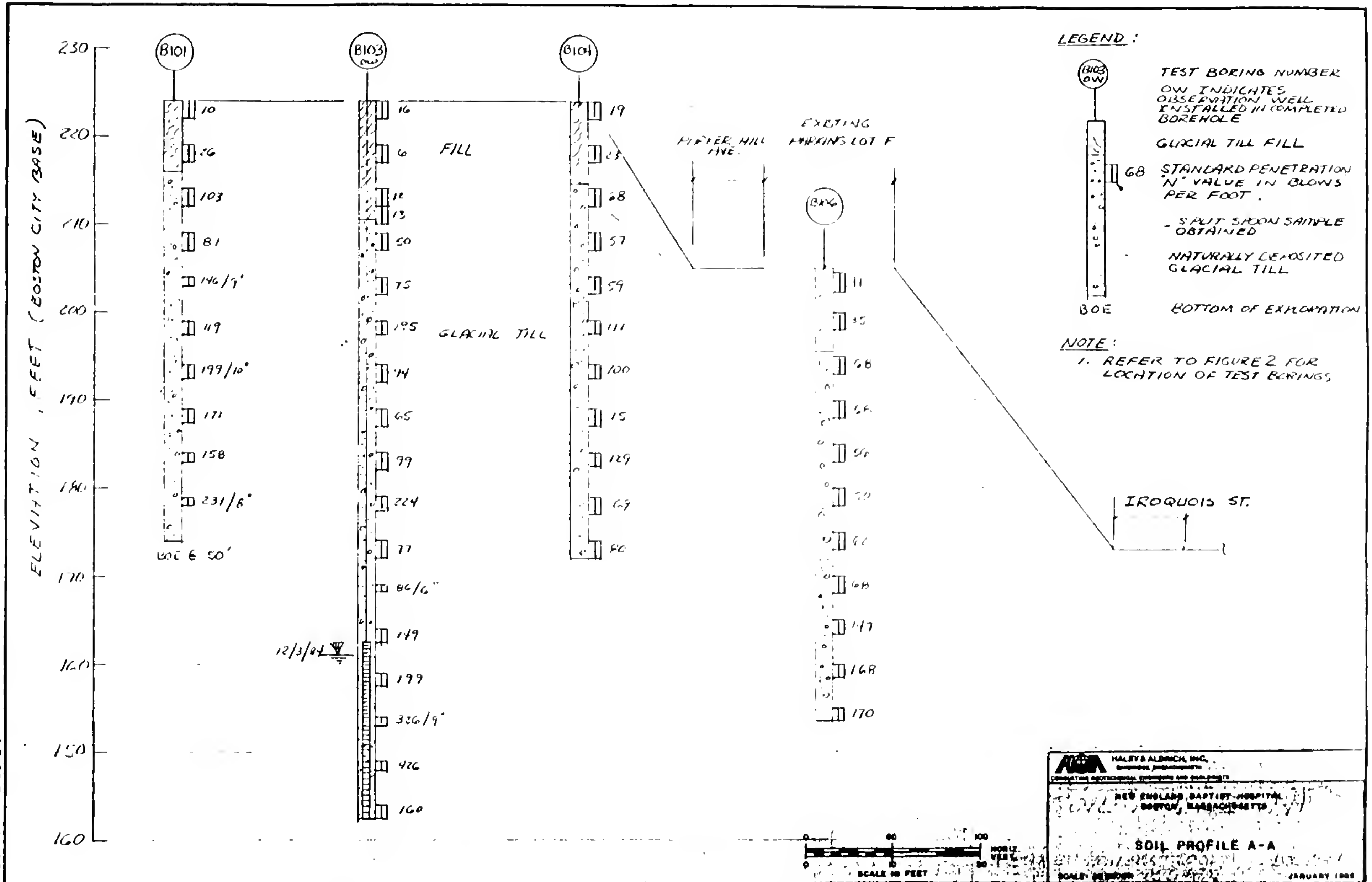
C
COURT
COURT
EAST
BRIGHAM CENTRAL
WEST
AMBULANCE
ENTRY
EXISTING PARKING
EXISTING PARKING
PARKER HILL AVENUE
IROQUOIS STREET
SACHEM STREET
LEGEND
BH9
OW
LOCATION AND IDENTIFICATION NUMBER OF PHASE II OBSERVATION WELL
B103
OW
LOCATION AND IDENTIFICATION NUMBER OF TEST BORING DRILLED BY CARR DEE TEST BORING AND CONSTRUCTION CORP DURING THE PERIOD 16 TO 20 NOVEMBER 1984. "OW" INDICATES OBSERVATION WELL INSTALLED IN THE COMPLETED BOREHOLE
210
160
ELEVATION OF TOP OF NATURALLY DEPOSITED GLACIAL TILL
ELEVATION OF GROUNDWATER MEASURED IN OBSERVATION WELL ON 20 DECEMBER 1984
A
SOIL PROFILE SEE FIGURES 1 THROUGH 5
NOTES
1. BASE PLAN PREPARED FROM 1" = 32' SCALE PLAN PREPARED BY PAYETTE ASSOCIATES, ENTITLED "SITE PLAN".
2. LOCATIONS OF TEST BORINGS WERE DETERMINED BY HALEY & ALDRICH PERSONNEL IN THE FIELD. ELEVATIONS OF TEST BORINGS WERE INTERPOLATED FROM SITE PLAN CONTOURS AND ARE APPROXIMATE
3. ELEVATIONS REFER TO BOSTON CITY BASE
0
80
160
HALEY & ALDRICH, INC
CAMBRIDGE MASSACHUSETTS
CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS
NEW ENGLAND BAPTIST HOSPITAL
BOSTON, MASSACHUSETTS
TEST BORING LOCATION PLAN

NO 4612 50 B3



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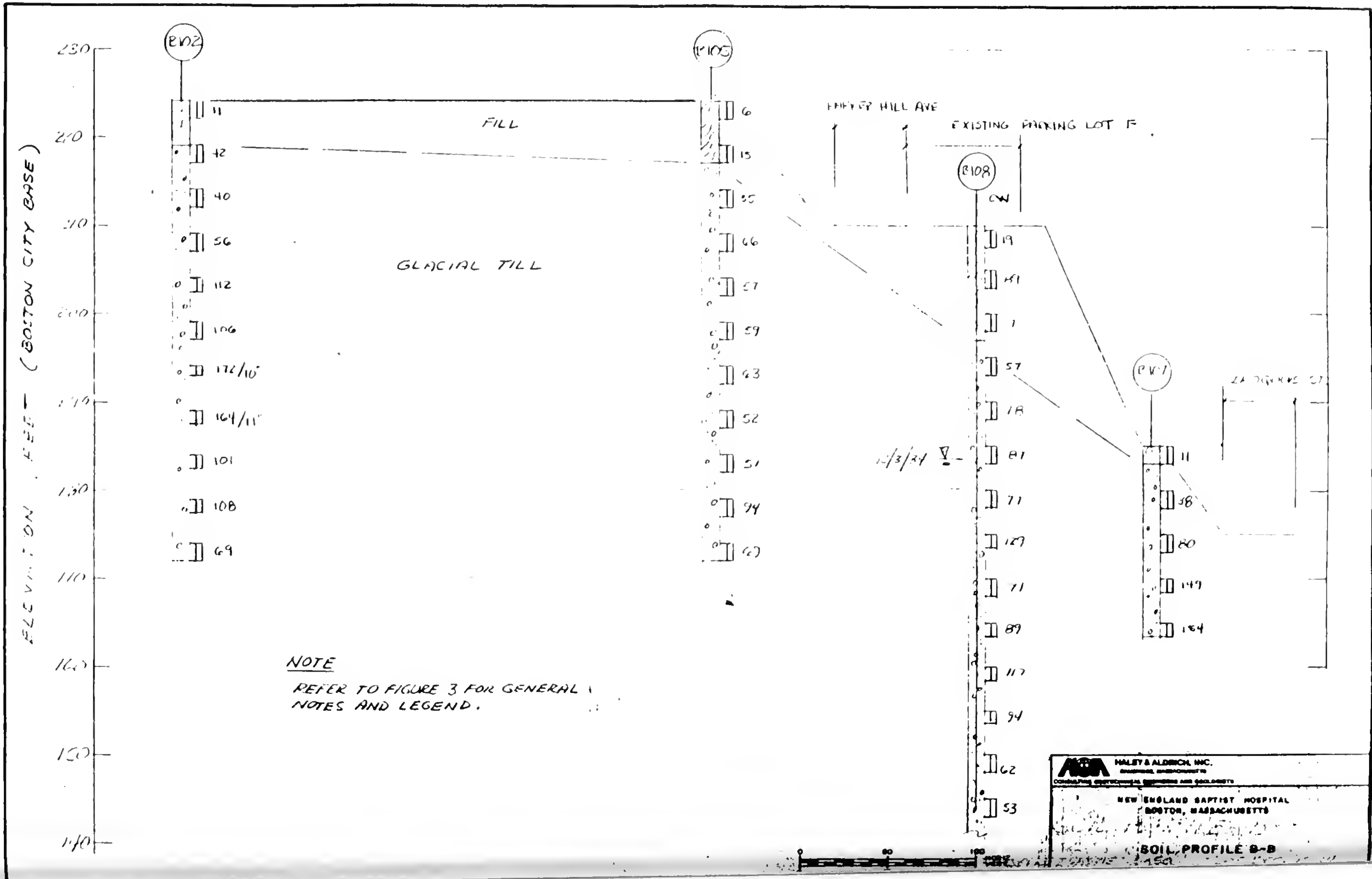

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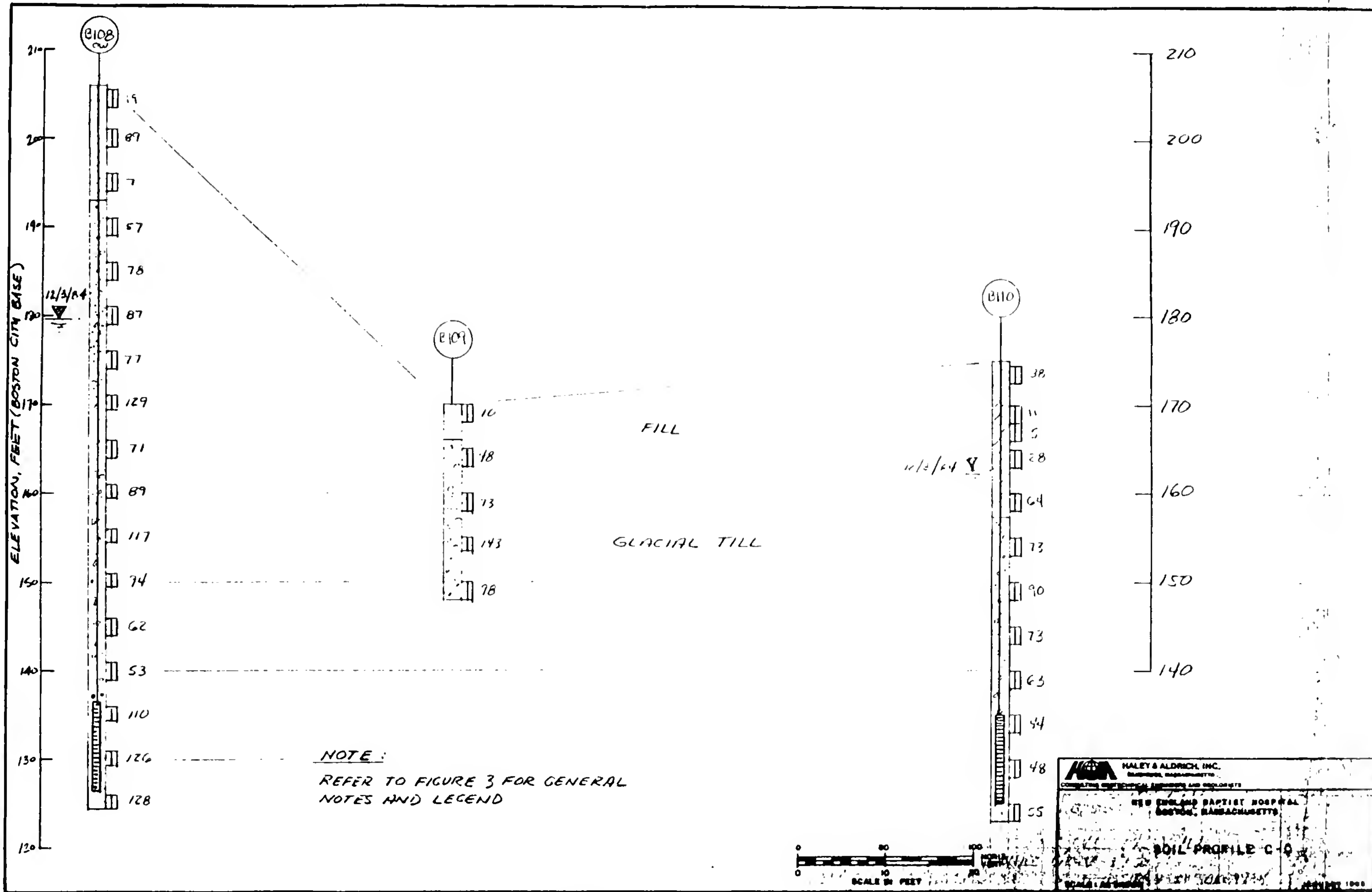

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CARR-DEE TEST BORING AND CONSTRUCTION CORPORATION

37 LINDEN STREET P.O. BOX 321 MEDFORD, MASSACHUSETTS 02155 Telephone 391-4500

To HALEY & ALDRICH, INC., CAMBRIDGE, MA Date NOVEMBER 30, 1984 Job. No. 84414

Location NEW ENGLAND BAPTIST HOSPITAL, BOSTON, MA (H&A FILE NO. 461250) Scale 1" = 4 ft.

BORING 101

GROUND SURFACE

Depth	Casing Blows	Description	Sample Blows	Sample
	3 5 17 23 27	LOAMY SAND & ROOTS, SILT	3 5 5 11	S#1, FROM G.S. TO 2'0" RECOVERED 14"
			7 14 12 22	S#2, FROM 5'0" TO 7'0" RECOVERED 14"
8'0"				
		VERY DENSE FINE SAND GRAVEL, SILT & COBBLES, SOME CLAY	37 76 27 25	S#3, FROM 10'0" TO 12'0" RECOVERED 10"
			23 41 40 52	S#4, FROM 15'0" TO 17'0" RECOVERED 14"
			56 120/3"	S#5, FROM 20'0" TO 20'9" RECOVERED 5"
			51 57 62	S#6, FROM 25'0" TO 26'6" RECOVERED 10"
			29 72 127/4"	S#7, FROM 30'0" TO 31'4" RECOVERED 10"
35'0"				

(CONTINUED ON SHEET NO. 2)

CARR-DEE TEST BORING AND CONSTRUCTION CORPORATION

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To HALEY & ALDRICH, INC., CAMBRIDGE, MA Date NOVEMBER 30, 1984 Job. No. 84414

Location NEW ENGLAND BAPTIST HOSPITAL, BOSTON, MA (H&A FILE NO. 461250) Scale 1" = 4 ft.

BORING 101 (CONTINUED)

Depth	Description	Blows	Sample
35'0"		51 62 69	S#8, FROM 35'0" TO 36'6" RECOVERED 11"
	VERY DENSE FINE SAND, SAND, GRAVEL, SILT & COBBLES, SOME CLAY	67 191	S#9, FROM 40'0" TO 41'0" RECOVERED 5"
		131 100/2"	SAMPLED FROM 45'0" TO 45'8" NO RECOVERY
50'2"		200/2" *100/0"	S#10, FROM 50'0" TO 50'2" RECOVERED 1" *300-LB. WGT.

WATER LEVEL 11'6"
SIZE OF CASING NW, LENGTH 5'0"
NUMBER OF DRIVE SAMPLES (S), 10
DRILLER: F. WINGERTER, INSPECTOR: S. MILNES
DATE STARTED & COMPLETED: 11-21-84, 11-23-84

All samples have been visually classified by HJD Unless otherwise specified, water levels noted were observed at completion of borings, and do not necessarily represent permanent ground water levels. Figures in right hand column indicate number of blows required to drive TWO-INCH SPLIT SAMPLER 6 inches using 140 lb. weight falling 30 inches ±. Figures in column to left (if noted) indicate number of blows to drive casing one foot, using 300 lb. weight falling 24 inches ±.

CARR-DEE TEST BORING AND CONSTRUCTION CORPORATION
37 LINDEN STREET P.O. BOX 321 MEDFORD, MASSACHUSETTS 02155 Telephone 391-4500

To HALEY & ALDRICH, INC., CAMBRIDGE, MA Date NOVEMBER 30, 1984 Job. No. 84414

Location NEW ENGLAND BAPTIST HOSPITAL, BOSTON, MA (H&A FILE NO. 461250) Scale 1" = 4 ft.

BORING 102

GROUND SURFACE

Depth		Description		Sample
	4 10 14 17 20	MEDIUM DENSE FINE SAND, GRAVEL & CLAY, TRACE OF LOAM	7 6 5 6	S#1, FROM G.S. TO 2'0" RECOVERED 20"
5'0"	32 49 46	DENSE FINE SAND, GRAVEL, SOME CLAY, TRACE SILT	10 20 22 24	S#2, FROM 5'0" TO 7'0" RECOVERED 10"
			17 20 20 23	S#3, FROM 10'0" TO 12'0" RECOVERED 24"
14'0"		VERY DENSE FINE SAND, SOME CLAY, GRAVEL, FEW COBBLES, TRACE SILT	27 26 30 32	S#4, FROM 15'0" TO 17'0" RECOVERED 20"
			37 46 66	S#5, FROM 20'0" TO 21'6" RECOVERED 17"
			43 55 51 90	S#6, FROM 25'0" TO 27'0" RECOVERED 24"
30'0"		VERY DENSE FINE SAND, SILT, GRAVEL, TRACE OF CLAY	72 100/4"	S#7, FROM 30'0" TO 30'10" RECOVERED 10"
35'0"				

(CONTINUED ON SHEET NO. 2)

CARR-DEE TEST BORING AND CONSTRUCTION CORPORATION
37 LINDEN STREET P.O. BOX 321 MEDFORD, MASSACHUSETTS 02155 Telephone 391-4500

To HALEY & ALDRICH, INC., CAMBRIDGE, MA Date NOVEMBER 30, 1984 Job. No. 84414

Location NEW ENGLAND BAPTIST HOSPITAL, BOSTON, MA (H&A FILE NO. 461250) Scale 1" = 4 ft.

BORING 102 (CONTINUED)

Depth	Casing	Description	Blows	Sample
35'0"			47 64 100/5"	S#8, FROM 35'0" TO 36'5" RECOVERED 14"
		VERY DENSE FINE SAND, SILT, GRAVEL, FEW COBBLES, TRACE OF CLAY	32 34 67	S#9, FROM 40'0" TO 41'6" RECOVERED 18"
			26 38 70	S#10, FROM 45'0" TO 46'6" RECOVERED 18"
52'0"			26 30 39 41	S#11, FROM 50'0" TO 52'0" RECOVERED 20"

WATER LEVEL 11'6"
SIZE OF CASING NW, LENGTH 8'0"
NUMBER OF DRIVE SAMPLES (S), 11
DRILLER: S. DESIMONE, INSPECTOR: S. MILNES
DATE STARTED & COMPLETED: 11-20-84, 11-21-84

All samples have been visually classified by HJD Unless otherwise specified, water levels noted were observed at completion of borings, and do not necessarily represent permanent ground water levels. Figures in right hand column indicate number of blows required to drive TWO-INCH SPLIT SAMPLER 6 inches using 140 lb. weight falling 30 inches ±. Figures in column to left (if noted) indicate number of blows to drive casing one foot, using 300 lb. weight falling 24 inches ±.

CARR-DEE TEST BORING AND CONSTRUCTION CORPORATION

37 LINDEN STREET P.O. BOX 321 MEDFORD, MASSACHUSETTS 02155 Telephone 391-4500

To HALEY & ALDRICH, INC., CAMBRIDGE, MA Date NOVEMBER 30, 1984 Job. No. 84414

Location NEW ENGLAND BAPTIST HOSPITAL, BOSTON, MA (H&A FILE NO. 4612501) Scale 1" = 4 ft.

BORING 103

GROUND SURFACE

Depth	Casing blows	Description	Sampler blows	Samples
	4		2 7 9 11	S#1, FROM G.S. TO 2'0" RECOVERED 8"
	11			
	12			
	13	FILL		
	17			
	7	SAND	2 3 3 4	S#2, FROM 5'0" TO 7'0" RECOVERED 13"
	7			
	16			
	16	GRAVEL &		
	17			
	5	CLAY	3 6 6 8	SAMPLED FROM 10'0" TO 12'0" NO RECOVERY
	13			
	19		7 6 7	S#3, FROM 12'0" TO 13'6", REC. 14"
13'6"	20		19	S#3A, FROM 13'6" TO 14'0" RECOVERED 4"
	22	FINE SAND, GRAVEL & CLAY, TRACE OF SILT		
15'0"			11 28 22 31	S#4, FROM 15'0" TO 17'0" RECOVERED 13"
		VERY DENSE		
		FINE SAND,	25 34 41 47	S#5, FROM 20'0" TO 22'0" RECOVERED 17"
		GRAVEL &		
		CLAY,	26 126 69	S#6, FROM 25'0" TO 26'6" RECOVERED 12"
		TRACE SILT		
			35 45 49 92	S#7, FROM 30'0" TO 32'0" RECOVERED 10"
35'0"				

(CONTINUED ON SHEET NO. 2)

CARR-DEE TEST BORING AND CONSTRUCTION CORPORATION
37 LINDEN STREET P.O. BOX 321 MEDFORD, MASSACHUSETTS 02155 Telephone 391-4500

To HALEY & ALDRICH, INC., CAMBRIDGE, MA Date NOVEMBER 30, 1984 Job. No. 84414

Location NEW ENGLAND BAPTIST HOSPITAL, BOSTON, MA (H&A FILE NO. 461250) Scale 1" = 4 ft.

BORING 103 (CONTINUED)

Depth	Description	Blows	Sample
35'0"	VERY DENSE FINE SAND, GRAVEL & CLAY, TRACE SILT	24 27 38 57	S#8, FROM 35'0" TO 37'0" RECOVERED 17"
		26 44 55 66	S#9, FROM 40'0" TO 42'0" RECOVERED 18"
42'0"	VERY DENSE FINE SAND, GRAVEL COBBLES, CLAY, TRACE SILT	84 94 130	S#10, FROM 45'0" TO 46'6" RECOVERED 13"
		33 38 39 172	S#11, FROM 50'0" TO 52'0" RECOVERED 20"
		86 120/0"	SAMPLED FROM 55'0" TO 55'6" NO RECOVERY
		41 67 82	S#12, FROM 60'0" TO 61'6" RECOVERED 11"
64'0"	VERY DENSE FINE SAND, SILT, LITTLE GRAVEL, TRACE CLAY	68 89 110	S#13, FROM 65'0" TO 66'6" RECOVERED 9"
70'0"			

(CONTINUED ON SHEET NO. 3)

CARR-DEE TEST BORING AND CONSTRUCTION CORPORATION

37 LINDEN STREET P.O. BOX 321 MEDFORD, MASSACHUSETTS 02155 Telephone 391-4500

To HALEY & ALDRICH, INC., CAMBRIDGE, MA Date NOVEMBER 30, 1984 Job. No. 84414

Location NEW ENGLAND BAPTIST HOSPITAL, BOSTON, MA (H&A FILE NO. 461250) Scale 1" = 4 ft.

BORING 103 (CONTINUED)

Depth	Description	Blows	Sample
70'0"	VERY DENSE FINE SAND, SILT, LITTLE GRAVEL, TRACE CLAY	141 185/3"	S#14, FROM 70'0" TO 70'9" RECOVERED 7"
74'0"	VERY DENSE FINE SAND, CLAY, GRAVEL, COBBLES.	179 247	S#15, FROM 75'0" TO 76'0" RECOVERED 4"
		51 78 82	S#16, FROM 80'0" TO 81'6" RECOVERED 12"
81'6"			

WATER LEVEL 26'2"
SIZE OF CASING NW, LENGTH 15'0"
NUMBER OF DRIVE SAMPLES (S), 17
DRILLER: F. WINGERTER, INSPECTOR: S. MILNES
DATE STARTED & COMPLETED: 11-19-84, 11-24-84

OBSERVATION WELL INSTALLED (1-1/2" PVC PIPE, 20'0" SLOTTED, 61'6" SOLID), 81'6" BELOW GROUND SURFACE, INCLUDING ROADWAY BOX.

All samples have been visually classified by HJD Unless otherwise specified, water levels noted were observed at completion borings, and do not necessarily represent permanent ground water levels. Figures in right hand column indicate number of blows required to dr TWO-INCH SPLIT SAMPLER 6 inches using 140 lb. weight falling 30 inches ±. Figures in column to left (if noted) indicate numbe blows to drive casing one foot, using 300 lb. weight falling 24 inches ±.

CARR-DEE TEST BORING AND CONSTRUCTION CORPORATION

37 LINDEN STREET P.O. BOX 321 MEDFORD, MASSACHUSETTS 02155 Telephone 391-4500

To HALEY & ALDRICH, INC., CAMBRIDGE, MA Date NOVEMBER 30, 1984 Job. No. 84414

Location NEW ENGLAND BAPTIST HOSPITAL, BOSTON, MA (H&A FILE NO. 461250) Scale 1" = 4 ft.

BORING 104

GROUND SURFACE

Depth	Casing blows	Description	Sample blows	Sample
	7 14 12 20 26 36 39 40 51 99	LOAMY SAND, SILT, GRAVEL, CLAY, TRACE OF CONCRETE	6 10 9 7	S#1, FROM G.S. TO 2'0" RECOVERED 10"
			14 12 11 9	S#2, FROM 5'0" TO 7'0" RECOVERED 2"
9'6"				
		VERY DENSE SILT, FINE SAND, GRAVEL, CLAY, FEW COBBLES	26 32 36 39	S#3, FROM 10'0" TO 12'0" RECOVERED 18"
			26 27 30 29	S#4, FROM 15'0" TO 17'0" RECOVERED 12"
			22 29 30 39	S#5, FROM 20'0" TO 22'0" RECOVERED 20"
			40 42 69	S#6, FROM 25'0" TO 26'6" RECOVERED 16"
			29 37 63	S#7, FROM 30'0" TO 31'6" RECOVERED 18"
35'0"				

(CONTINUED ON SHEET NO. 3)

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To HALEY & ALDRICH, INC., CAMBRIDGE, MA Date NOVEMBER 30, 1984 Job. No. 84414

Location NEW ENGLAND BAPTIST HOSPITAL, BOSTON, MA (H&A FILE NO. 461250) Scale 1" = 4 ft.

BORING 104 (CONTINUED)

Depth	Description	Blows	Sample
35'0"		26 36 39 57	S#8, FROM 35'0" TO 37'0" RECOVERED 22"
	VERY DENSE FINE SAND, GRAVEL, CLAY, FEW COBBLES, TRACE OF SILT	87 50 79	S#9, FROM 40'0" TO 41'6" RECOVERED 15"
		21 30 39 35	S#10, FROM 45'0" TO 47'0" RECOVERED 20"
52'0"		30 39 41 40	S#11, FROM 50'0" TO 52'0" RECOVERED 20"

WATER LEVEL 5'0"
SIZE OF CASING NW, LENGTH 10'0"
NUMBER OF DRIVE SAMPLES (S), 11
DRILLER: S. DESIMONE, INSPECTOR: S. MILNES
DATE STARTED & COMPLETED: 11-21-84

All samples have been visually classified by HJD Unless otherwise specified, water levels noted were observed at completion of borings, and do not necessarily represent permanent ground water levels. Figures in right hand column indicate number of blows required to drive TWO-INCH SPLIT SAMPLER 6 inches using 140 lb. weight falling 30 inches ±. Figures in column to left (if noted) indicate number of blows to drive casing one foot, using 300 lb. weight falling 24 inches ±.

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To HALEY & ALDRICH, INC., CAMBRIDGE, MA Date NOVEMBER 30, 1984 Job. No. 84414

Location NEW ENGLAND BAPTIST HOSPITAL, BOSTON, MA (H&A FILE NO. 461250) Scale 1" = 4 ft.

BORING 105

Depth	Description	Blows	Sample
GROUND SURFACE			
	LOAMY SAND, GRAVEL & CLAY, LITTLE BRICK	2 3 3 4	S#1, FROM G.S. TO 2'0" RECOVERED 10"
		6 7 8 14	S#2, FROM 5'0" TO 7'0" RECOVERED 12"
7'0"	DENSE FINE SAND, SOME GRAVEL & CLAY, TRACE SILT	13 15 20 19	S#3, FROM 10'0" TO 12'0" RECOVERED 15"
13'0"	VERY DENSE FINE SAND AND SILT, LITTLE GRAVEL, TRACE CLAY, FEW COBBLES	23 34 32 23	S#4, FROM 15'0" TO 17'0" RECOVERED 13"
		20 26 31 30	S#5, FROM 20'0" TO 22'0" RECOVERED 18"
		19 25 34 46	S#6, FROM 25'0" TO 27'0" RECOVERED 20"
30'0"	VERY DENSE FINE SAND, CLAY, LITTLE GRAVEL, TRACE SILT, FEW COBBLES	25 29 34 43	S#7, FROM 30'0" TO 32'0" RECOVERED 20"
35'0"			

(CONTINUED ON SHEET NO. 2)

CARR-DEE TEST BORING AND CONSTRUCTION CORPORATION
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To HALEY & ALDRICH, INC., CAMBRIDGE, MA Date NOVEMBER 30, 1984 Job. No. 84414

Location NEW ENGLAND BAPTIST HOSPITAL, BOSTON, MA (H&A FILE NO. 461250) Scale 1" = 4 ft.

BORING 105 (CONTINUED)

Depth	Description	Blows	Sample
35'0"		25 27 25 29	S#8, FROM 35'0" TO 37'0" RECOVERED 18"
	VERY DENSE FINE SAND, GRAVEL & CLAY, FEW COBBLES, TRACE SILT	18 22 29 27	S#9, FROM 40'0" TO 42'0" RECOVERED 24"
		32 39 55 64	S#10, FROM 45'0" TO 47'0" RECOVERED 21"
52'0"		24 25 44 37	S#11, FROM 50'0" TO 52'0" RECOVERED 20"

WATER LEVEL 13'6"
SIZE OF CASING NW, LENGTH 9'0"
NUMBER OF DRIVE SAMPLES (S), 11
DRILLER: S. DESIMONE, INSPECTOR: S. MILNES
DATE STARTED & COMPLETED: 11-23-84

All samples have been visually classified by HJD Unless otherwise specified, water levels noted were observed at completion of borings and do not necessarily represent permanent ground water levels. Figures in right hand column indicate number of blows required to drive TWO-INCH SPLIT SAMPLER 6 inches using 140 lb. weight falling 30 inches ±. Figures in column to left (if noted) indicate number of blows to drive casing one foot, using 300 lb. weight falling 24 inches ±.

SHEET 2 of 2

CARR-DEE TEST BORING AND CONSTRUCTION CORPORATION
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To HALEY & ALDRICH, INC., CAMBRIDGE, MA Date NOVEMBER 30, 1984 Job. No. 84414

Location NEW ENGLAND BAPTIST HOSPITAL, BOSTON, MA (H&A FILE NO. 461250) Scale 1" = 4 ft.

BORING 106

GROUND SURFACE

Depth	Casing Blows	Description	Sampler Blows	Sample
0'3"	8	ASPHALT		
	10 9 11 10 14 14 11 15 59	FILL SAND, GRAVEL, CINDERS, LITTLE SILT, TRACE OF CLAY	20 26 15 11	S#1, FROM 0'6" TO 2'6" RECOVERED 20"
			16 21 14 9	S#2, FROM 5'0" TO 7'0" RECOVERED 16"
9'6"		VERY DENSE FINE SAND, SILT, GRAVEL, TRACE CLAY, COARSE TO MEDIUM SAND	22 23 45 36	S#3, FROM 10'0" TO 12'0" RECOVERED 18"
			26 28 40 44	S#4, FROM 15'0" TO 17'0" RECOVERED 20"
			17 28 28 36	S#5, FROM 20'0" TO 22'0" RECOVERED 18"
25'0"		VERY DENSE FINE SAND, CLAY, GRAVEL, TRACE SILT, COARSE TO MEDIUM SAND	18 25 25 29	S#6, FROM 25'0" TO 27'0" RECOVERED 24"
			25 28 34 43	SAMPLED FROM 30'0" TO 32'0" NO RECOVERY
35'0"				

(CONTINUED ON SHEET NO. 2)

CARR-DEE TEST BORING AND CONSTRUCTION CORPORATION
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To HALEY & ALDRICH, INC., CAMBRIDGE, MA Date NOVEMBER 30, 1984 Job. No. 84414

Location NEW ENGLAND BAPTIST HOSPITAL, BOSTON, MA (H&A FILE NO. 461250) Scale 1" = 4 ft.

BORING 106 (CONTINUED)

Depth	Description	Blows	Sample
35'0"	VERY DENSE FINE SAND, GRAVEL, CLAY, TRACE SILT, COARSE TO MEDIUM SAND, FEW COBBLES	28 28 40 41	S#7, FROM 35'0" TO 37'0" RECOVERED 20"
		50 67 80	S#8, FROM 40'0" TO 41'6" RECOVERED 12"
		53 101 64	S#9, FROM 45'0" TO 46'6" RECOVERED 15"
51'6"		40 66 104	S#10, FROM 50'0" TO 51'6" RECOVERED 8"

WATER LEVEL 10'0"
SIZE OF CASING NW, LENGTH 10'0"
NUMBER OF DRIVE SAMPLES (S), 10
DRILLER: S. DESIMONE, INSPECTOR: S. MILNES
DATE STARTED & COMPLETED: 11-19-84, 11-20-84

All samples have been visually classified by HJD Unless otherwise specified, water levels noted were observed at completion of borings, and do not necessarily represent permanent ground water levels. Figures in right hand column indicate number of blows required to drive TWO-INCH SPLIT SAMPLER 6 inches using 140 lb. weight falling 30 inches ±. Figures in column to left (if noted) indicate number of blows to drive casing one foot, using 300 lb. weight falling 24 inches ±.

CARR-DEE TEST BORING AND CONSTRUCTION CORPORATION

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To HALEY & ALDRICH, INC., CAMBRIDGE, MA Date NOVEMBER 30, 1984 Job. No. 84414

Location NEW ENGLAND BAPTIST HOSPITAL, BOSTON, MA (H&A FILE NO. 461250) Scale 1" = 4 ft.

BORING 107

GROUND SURFACE

Depth	Casing blows	Description	Sample blows	Sample
1'0"	7	LOAMY SAND, GRAVEL	2 4	S#1, FROM G.S. TO 1'0", REC. 6"
2'0"	27	MED. DENSE FINE SAND, GRAVEL, LITTLE CLAY, SILT	7 11	S#1A, FROM 1'0" TO 2'0", REC. 5"
8'0"	58 92 127/11"	DENSE FINE SAND, GRAVEL & CLAY, FEW COBBLES, TRACE SILT, COARSE TO MEDIUM SAND	18 17 21 25	S#2, FROM 5'0" TO 7'0" RECOVERED 14"
21'6"		VERY DENSE FINE SAND, GRAVEL, CLAY, FEW COBBLES, TRACE COARSE TO MEDIUM SAND, SILT	19 24 56 54	S#3, FROM 10'0" TO 12'0" RECOVERED 11"
			49 64 85	S#4, FROM 15'0" TO 16'6" RECOVERED 17"
			56 67 87	S#5, FROM 20'0" TO 21'6" RECOVERED 12"

WATER LEVEL 5'0"
SIZE OF CASING NW, LENGTH 4'11"
NUMBER OF DRIVE SAMPLES (S), 6
DRILLER: F. WINGERTER, INSPECTOR: S. MILNES
DATE STARTED & COMPLETED: 11-24-84

All samples have been visually classified by HJD Unless otherwise specified, water levels noted were observed at completion of borings, and do not necessarily represent permanent ground water levels. Figures in right hand column indicate number of blows required to drive TWO-INCH SPLIT SAMPLER 6 inches using 140 lb. weight falling 30 inches ±. Figures in column to left (if noted) indicate number of blows to drive casing one foot, using 300 lb. weight falling 24 inches ±.

SHEET 1 of 1

CARR-DEE TEST BORING AND CONSTRUCTION CORPORATION
37 LINDEN STREET P.O. BOX 321 MEDFORD, MASSACHUSETTS 02155 Telephone 391-4500

To: HALEY & ALDRICH, INC., CAMBRIDGE, MA — Date: NOVEMBER 30, 1984 — Job. No. 84414

Location: NEW ENGLAND BAPTIST HOSPITAL, BOSTON, MA (H&A FILE NO. 461250) — Scale 1" = 4 ft.

BORING 108

GROUND SURFACE

Depth	Casing Blows	Description	Sampler Blows	Sample
0'3"	2	ASPHALT		
	4		20 12 7 7	S#1, FROM 0'6" TO 2'6" RECOVERED 6"
	6	FILL		
	11			
	10	SAND,		
	21			
	46	GRAVEL, LOAM,	60 71 18 10	S#2, FROM 5'0" TO 7'0" RECOVERED 8"
	42	SILT		
	25			
	30			
	8		7 3 4 5	S#3, FROM 10'0" TO 12'0" RECOVERED 1"
	10			
13'0"	35			
	55			
	57			
		VERY DENSE	21 31 26 46	S#4, FROM 15'0" TO 17'0" RECOVERED 12"
		FINE SAND,	29 39 39 56	S#5, FROM 20'0" TO 22'0" RECOVERED 18"
		GRAVEL &		
		CLAY, FEW COBBLES.	29 41 46 61	S#6, FROM 25'0" TO 27'0" RECOVERED 20"
		TRACE COARSE TO MEDIUM	29 37 40 53	S#7, FROM 30'0" TO 32'0" RECOVERED 20"
35'0"		SAND, SILT		

(CONTINUED ON SHEET NO. 2)

CARR-DEE TEST BORING AND CONSTRUCTION CORPORATION

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To: HALEY & ALDRICH, INC., CAMBRIDGE, MA Date: NOVEMBER 30, 1984 Job. No. 84414

Location: NEW ENGLAND BAPTIST HOSPITAL, BOSTON, MA (H&A FILE NO. 461250) Scale 1" = 4 ft.

BORING 108 (CONTINUED)

Depth	Description	Blows	Sample
35'0"		67 53 76	S#8, FROM 35'0" TO 36'6" RECOVERED 6"
	VERY DENSE	23 28 43 59	S#9, FROM 40'0" TO 42'0" RECOVERED 20"
	FINE SAND,		
	GRAVEL &	29 36 53	S#10, FROM 45'0" TO 46'6" RECOVERED 18"
	CLAY, FEW COBBLES,		
	TRACE COARSE TO MEDIUM	30 50 67	S#11, FROM 50'0" TO 51'6" RECOVERED 15"
	SAND, SILT		
		24 28 66	S#12, FROM 55'0" TO 56'6" RECOVERED 18"
		27 28 34 52	S#13, FROM 60'0" TO 62'0" RECOVERED 24"
		28 25 28 45	S#14, FROM 65'0" TO 67'0" RECOVERED 24"
70'0"			

(CONTINUED ON SHEET NO. 3)

CARR-DEE TEST BORING AND CONSTRUCTION CORPORATION

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To HALEY & ALDRICH, INC., CAMBRIDGE, MA Date NOVEMBER 30, 1984 Job. No. 84414

Location NEW ENGLAND BAPTIST HOSPITAL, BOSTON, MA (H&A FILE NO. 461250) Scale 1" = 4 ft.

BORING 108 (CONTINUED)

Depth	Description	Blows	Sample
70'0"	VERY DENSE FINE SAND, GRAVEL & CLAY, FEW COBBLES, TRACE COARSE TO MEDIUM SAND, SILT	29 41 69	S#15, FROM 70'0" TO 71'6" RECOVERED 8"
		38 47 79	S#16, FROM 75'0" TO 76'6" RECOVERED 12"
81'6"		38 51 77	S#17, FROM 80'0" TO 81'6" RECOVERED 8"

WATER LEVEL 19'6"
SIZE OF CASING NW, LENGTH 15'0"
NUMBER OF DRIVE SAMPLES (S), 17
DRILLER: S. DESIMONE, INSPECTOR: S. MILNES
DATE STARTED & COMPLETED: 11-16-84, 11-19-84

OBSERVATION WELL INSTALLED (1-1/2" PVC PIPE, 10'0" SLOTTED, 70'0" SOLID), 80'0" BELOW GROUND SURFACE, INCLUDING ROADWAY BOX.

All samples have been visually classified by HJD Unless otherwise specified, water levels noted were observed at completion of borings, and do not necessarily represent permanent ground water levels. Figures in right hand column indicate number of blows required to drive TWO-INCH SPLIT SAMPLER 6 Inches using 140 lb. weight falling 30 inches ±. Figures in column to left (if noted) indicate number of blows to drive casing one foot, using 300 lb. weight falling 24 inches ±.

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To HALEY & ALDRICH, INC., CAMBRIDGE, MA Date NOVEMBER 30, 1984 Job. No. 84414

Location NEW ENGLAND BAPTIST HOSPITAL, BOSTON, MA (H&A FILE NO. 461250) Scale 1" = 4 ft.

BORING 109

GROUND SURFACE

Depth	Casing blows	Description	Sample blows	Sample
0'3"	40	ASPHALT		
	16 14 28	SAND, GRAVEL, CLAY, LITTLE SILT	4 5 5 6	S#1, FROM 0'3" TO 2'3" RECOVERED 14"
4'0"				
	62 63/6"	DENSE FINE SAND, GRAVEL, SILT, TRACE CLAY	18 22 26 23	S#2, FROM 5'0" TO 7'0" RECOVERED 8"
8'0"				
		VERY DENSE FINE SAND, GRAVEL & CLAY, TRACE COARSE TO MEDIUM SAND, SILT	22 34 39 44	S#3, FROM 10'0" TO 12'0" RECOVERED 19"
			79 86 57	S#4, FROM 15'0" TO 16'6" RECOVERED 9"
			26 48 50 110	S#5, FROM 20'0" TO 22'0" RECOVERED 13"
22'0"				

WATER LEVEL 8'7"
SIZE OF CASING NW, LENGTH 5'6"
NUMBER OF DRIVE SAMPLES (S), 5
DRILLER: F. WINGERTER, INSPECTOR: S. MILNES
DATE STARTED & COMPLETED: 11-19-84

All samples have been visually classified by HJD Unless otherwise specified, water levels noted were observed at completion of borings, and do not necessarily represent permanent ground water levels. Figures in right hand column indicate number of blows required to drive TWO-INCH SPLIT SAMPLER 6 inches using 140 lb. weight falling 30 inches ±. Figures in column to left (if noted) indicate number of blows to drive casing one foot, using 300 lb. weight falling 24 inches ±.

SHEET 1 of 1

CARR-DEE TEST BORING AND CONSTRUCTION CORPORATION

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To HALEY & ALDRICH, INC., CAMBRIDGE, MA Date NOVEMBER 30, 1984 Job. No. 84414

Location NEW ENGLAND BAPTIST HOSPITAL, BOSTON, MA (H&A FILE NO. 461250) Scale 1" = 4 ft

BORING 110

GROUND SURFACE

Depth	Casing blows	Description	Sampler blows	Sample
0'3"	67	ASPHALT		
	71		14 17 21 24	S#1, FROM 0'6" TO 2'6" RECOVERED 7"
	63			
	37			
	18	FILL		
	14		5 5 6 7	SAMPLED FROM 5'0" TO 7'0" NO RECOVERY
	10	SAND,		
	5		6 2 3 5	S#2, FROM 7'0" TO 9'0" RECOVERED 19"
	11	GRAVEL,		
	21			
	20	LITTLE SILT	16 18 15 24	S#3, FROM 10'0" TO 12'0" RECOVERED 5"
	29			
	27			
	31			
	67			
	37		29 31 33 30	S#4, FROM 15'0" TO 17'0" RECOVERED 4"
	48			
17'6"	112			
	164	VERY DENSE		
	250/6"			
		FINE SAND, SILT	24 41 32 37	S#5, FROM 20'0" TO 22'0" RECOVERED 12"
		GRAVEL &	33 41 39 40	S#6, FROM 25'0" TO 27'0" RECOVERED 19"
		TRACE CLAY		
			27 31 42 39	S#7, FROM 30'0" TO 32'0" RECOVERED 20"
35'0"				

(CONTINUED ON SHEET NO. 2)

CARR-DEE TEST BORING AND CONSTRUCTION CORPORATION
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To HALEY & ALDRICH, INC., CAMBRIDGE, MA Date NOVEMBER 30, 1984 Job. No. 84414

Location NEW ENGLAND BAPTIST HOSPITAL, BOSTON, MA (H&A FILE NO. 461250) Scale 1" = 4 ft.

BORING 110 (CONTINUED)

Depth	Description	Blows	Sample
35'0" – 40'0"	VERY DENSE FINE SAND, SILT, GRAVEL, TRACE CLAY	17 26 37 35	S#8, FROM 35'0" TO 37'0" RECOVERED 20"
40'0" – 50'0"	DENSE FINE SAND, GRAVEL, CLAY, LITTLE SILT	18 20 24 23	S#9, FROM 40'0" TO 42'0" RECOVERED 22"
		19 24 24 42	S#10, FROM 45'0" TO 47'0" RECOVERED 14"
50'0" – 52'0"	VERY DENSE COARSE TO FINE SAND, CLAY, LITTLE GRAVEL & SILT	28 24 31 40	S#11, FROM 50'0" TO 52'0" RECOVERED 6"

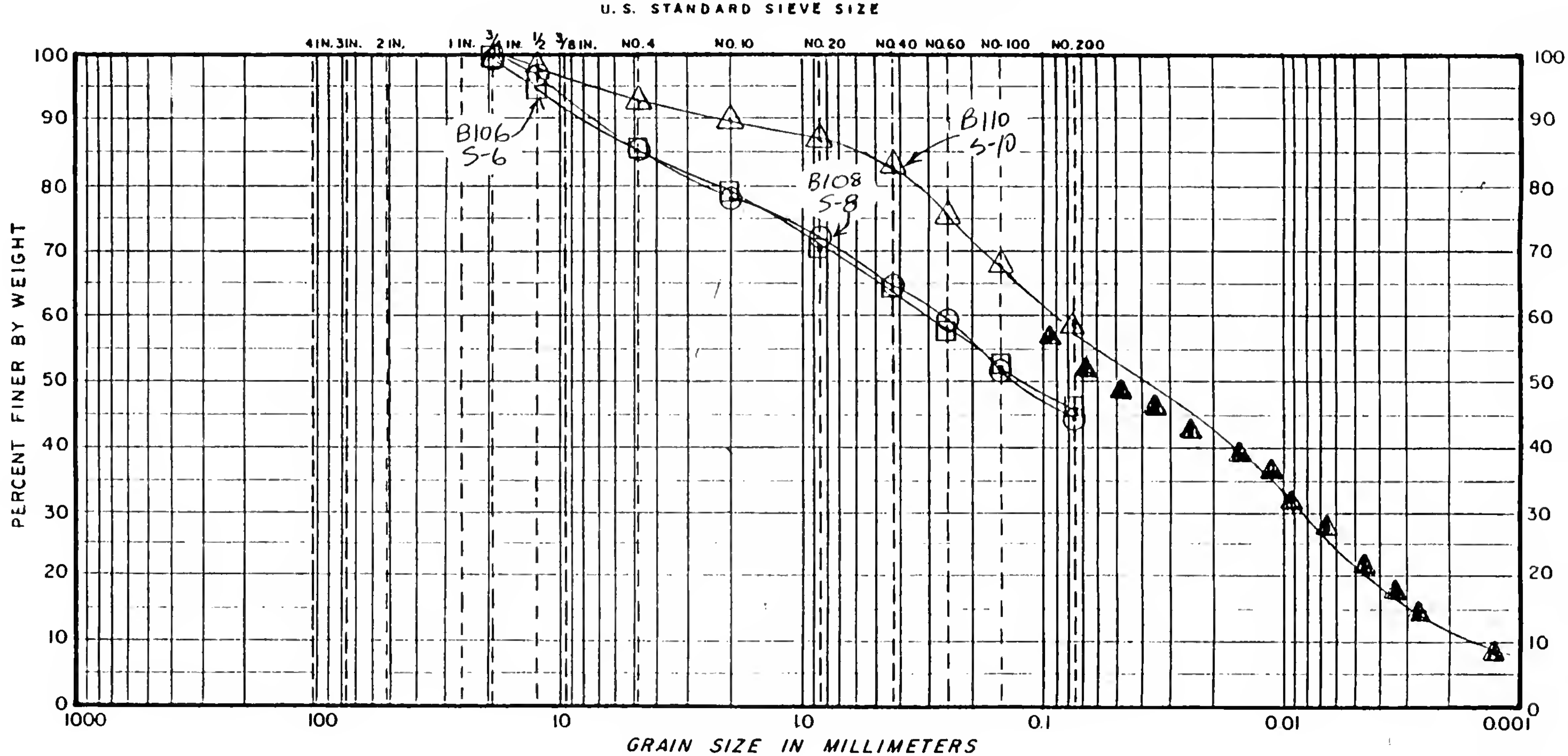
WATER LEVEL 15'0"
SIZE OF CASING NW, LENGTH 20'0"
NUMBER OF DRIVE SAMPLES (S), 11
DRILLER: F. WINGERTER, INSPECTOR: S. MILNES
DATE STARTED & COMPLETED: 11-16-84

OBSERVATION WELL INSTALLED(1-1/2" PVC PIPE, 10'0" SLOTTED, 40'0" SOLID), 50'0" BELOW GROUND SURFACE, INCLUDING ROADWAY BOX.

All samples have been visually classified by HJD Unless otherwise specified, water levels noted were observed at completion of borings, and do not necessarily represent permanent ground water levels. Figures in right hand column indicate number of blows required to drive TWO-INCH SPLIT SAMPLER 6 inches using 140 lb. weight falling 30 inches ±. Figures in column to left (if noted) indicate number of blows to drive casing one foot, using 300 lb. weight falling 24 inches ±.

SHEET 2 of 2

GRAIN SIZE DISTRIBUTION



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

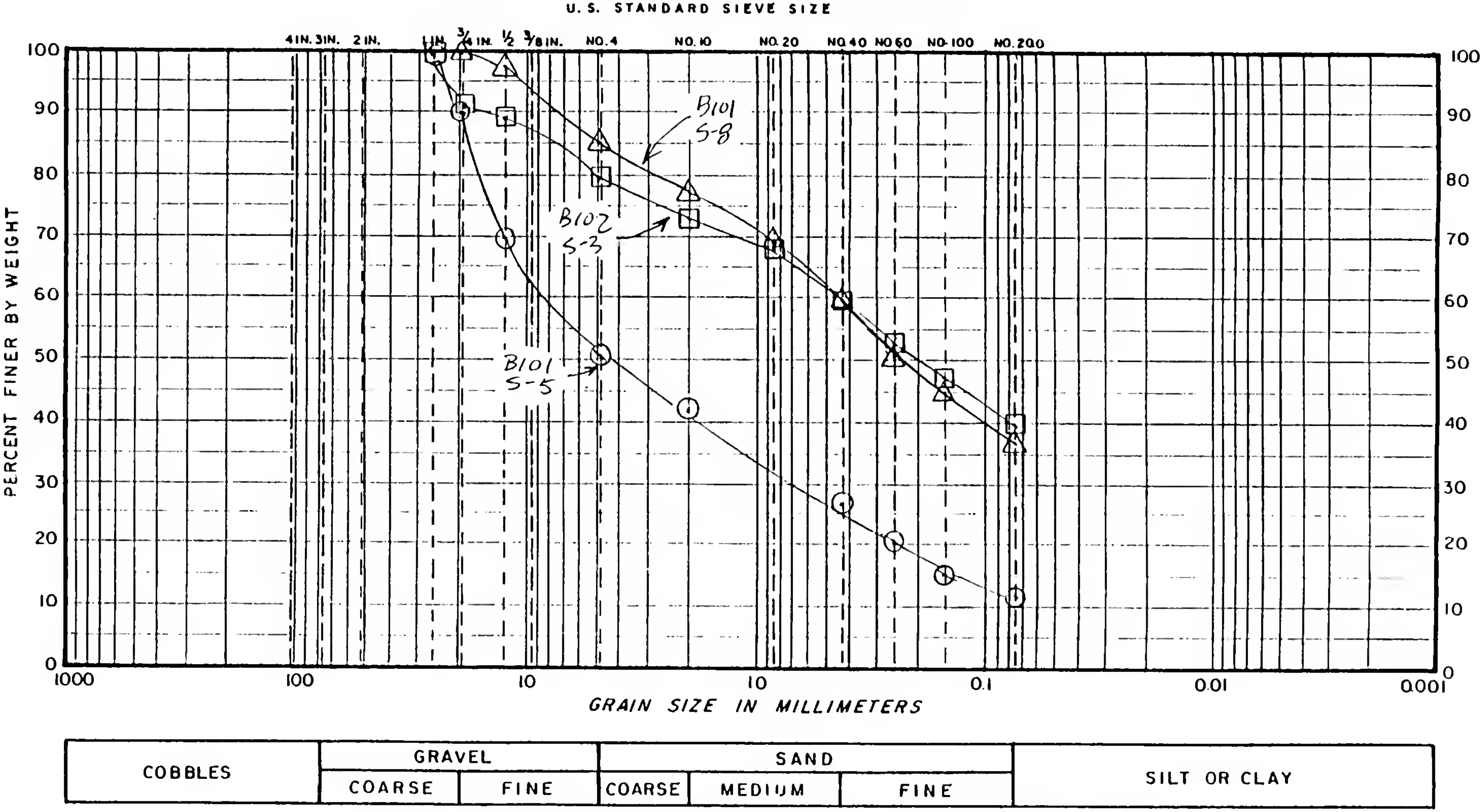
UNIFIED SOIL CLASSIFICATION SYSTEM, CORPS OF ENGINEERS, U.S ARMY

BORING	SAMPLE	DEPTH(FT)	W_l (%)	W_p (%)	DESCRIPTION
B106	S-6	25 - 27	--	--	Brown silty medium to fine SAND, little gravel, trace coarse sand
B108	S-8	35 - 36.5	--	--	Brown silty medium to fine SAND, little gravel, trace coarse sand
B110	S-10	45 - 47	26	24	Brown sandy SILT, trace gravel and clay

PROJECT NEW ENGLAND BAPTIST HOSPITAL, BOSTON, MA

FILE NO. 461250 DATE JAN. 1984

GRAIN SIZE DISTRIBUTION



UNIFIED SOIL CLASSIFICATION SYSTEM, CORPS OF ENGINEERS, U.S ARMY

BORING	SAMPLE	DEPTH (FT)	DESCRIPTION
B101	S-5	20 - 20.9	Brown gravelly coarse to fine SAND, little silt
B101	S-8	35 - 36.5	Brown silty medium to fine SAND, little gravel, trace coarse sand
B102	S-3	10 - 12	Brown silty medium to fine SAND, some gravel, trace coarse sand

PROJECT NEW ENGLAND BAPTIST HOSPITAL, BOSTON, MA

FILE NO 461250 DATE JAN. 1985

HALEY & ALDRICH, INC.

HMM Associates, Inc.

A Summit Company

Other Summit Companies:

WW Engineering & Science · WW Operation Services · Sigma Research Corporation